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Connection Body Mass Index with Incident Hypertension on Elderly at Sail Community Health Center , Pekanbaru 2025

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Abstract : Background : Hypertension is characterized by elevated blood pressure, specifically when systolic blood pressure exceeds 140 mmHg and diastolic blood pressure exceeds 90 mmHg. At the Puskesmas Sail in Pekanbaru City, there were 1,276 patients diagnosed with hypertension in 2024. Hypertension remains the third most common disease at the Puskesmas Sail . Additionally, elderly patients dominate the patient population at this Community Health Center . One of the factors contributing to increased blood pressure is body mass index (BMI). Therefore, the researchers were interested in conducting a study on the relationship between BMI and the incidence of hypertension at Puskesmas Sail. **Objective** : To determine the relationship between BMI and the incidence of hypertension among the elderly in the service area of the Puskesmas Sail in Pekanbaru City. **Method** : This study used an analytical observational design with a cross-sectional study design. The study was conducted at Puskesmas Sail in Pekanbaru. The sample was selected using accidental sampling. Data analysis was performed using the chi-square test. **Results** : There is a relationship between BMI and the incidence of hypertension among the elderly in the service area of the Puskesmas Sail in Pekanbaru City.

Keywords : Hypertension, BMI, Elderly

1. BACKGROUND

Hypertension is Wrong One disease No infectious Which marked by improvement pressure blood Where when pressure blood systolic more than 140 mmHg and diastolic blood pressure more than 90 mmHg. blood pressure in on normal can cause pain And death in a person. Hypertension is a degenerative disease, which is not a disease infection Where can controlled. Hypertension Also known as a " *silent killer* " because it often does not show symptoms and if not treated and controlled will cause cardiovascular disease, blood vessel disorders, kidney problems and other conditions which can ultimately lead to disability and even death (Zahra and Siregar, 2023).

The World Health Organization (WHO) in 2015 showed that approximately 1.13 billion person in world suffer hypertension, It means 1 from 3 people in world diagnosed hypertension. Amount sufferers hypertension Keep going increasing every year, estimated at in 2025 there will be 1.5 billion people suffer from hypertension, and it is estimated that every year 9.4 million people die from hypertension and its complications (Rahmawati and Kasih, 2023).

The World Health Organization (WHO) estimates the current global prevalence of hypertension at 22% of the total population. Africa has the highest prevalence of hypertension, at 27%, while Southeast Asia has the highest prevalence. occupy order third with prevalence hypertension as big as 25% of the total population and the lowest prevalence of hypertension was reported to be in in the region American that is as big as 18%. Death consequence disease Non-communicable diseases, one of which is caused by hypertension, have continued to increase every year throughout the world (Musa, 2022).

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Sail Community Health Center is a community health center in Sail District, Pekanbaru City, with a population of 22,498. The number of female residents (11,324) is greater than the number of males (11,174). The largest age group is estimated to be 20–44 years old. In 2023, the number of hypertension sufferers was recorded at around 1,300 people and decreased to around 1,150 people in 2024. Of these, more than 700 patients were elderly people aged over 45 years. Despite showing a decline, hypertension remains one of the three most common diseases at Sail Community Health Center and is the most common disease in the elderly group. (Sail Health Center, 2024).

Lots factor Which play a role in the occurrence of hypertension among other factors risk Which No controlled and factor risk Which can Uncontrollable risk factors include heredity, gender, race, and age. Controllable risk factors include obesity and lack of exercise or activity. physique, smoking, drinking coffee, sodium sensitivity, low potassium levels (Rahmadhani, 2021).

Age is a risk factor that influences hypertension, namely the greater the risk of developing hypertension as a person gets older. Classification age is as following: child 0-9 year; teenager 10-19 years; young adults 20-35 years; adults 36-45 years; pre-elderly 46-60 years; elderly >60 years. Ages 55-59 years have a risk of hypertension of 2.18 time, And age 60-64 year experience improvement occurrence .

The risk of hypertension is 2.45 times greater in those aged >70 years and 2.97 times greater in those aged 70+. It has been explained that in old age, large arteries lose elasticity and become stiff, forcing blood flowing with each heartbeat into narrower vessels, leading to increased blood pressure (Salsabila *et al.* , 2023).

One of the factors that triggers increased blood pressure is body mass index. body. BMI has a big impact on the incidence of hypertension, and BMI that excessive associated with factor risk hypertension Which more high compared to with BMI in range normal. Matter This happen Because BMI describes composition carbohydrate And fat Which tall causing accumulation triglycerides Which sustainable in vessels blood, Which which is the initial process of atherosclerosis, which is a trigger for hypertension (Abineno and Malinti, 2022).

Related to the background description above, the researcher is interested in conducting research on the relationship between body mass index and the incidence of hypertension in the elderly at the Sail Community Health Center.

2. THEORETICAL STUDY

Hypertension is a non-communicable disease. Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or greater and a diastolic blood pressure (DBP) of 90 mm Hg or greater after a blood pressure measurement. repeated. Results measurement This valid For all over individual / patients with adult age (> 18 years) .

According to *The Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 8)* classification pressure blood on person mature (18 year And more old) is based on the average of two or more correctly measured blood pressure readings. blood from two or more visit clinical. If pressure blood systolic and pressure values blood diastolic fall into the category that different, the overall classification is determined based on the higher of the two blood pressures. blood is classified into one of the four category: normal, prehypertension, hypertension degrees 1 And grade 2 hypertension (Adrian, 2019).

Table 1 Classification hypertension according to JNC 8 (Adrian, 2019)

Classification	Systolic	Diastolic
Normal	<120	And < 80
Pre Hypertension	120 – 139	Or 80- 89
Hypertension Degrees 1	140 – 159	Or 90-99
Hypertension Degrees 2	≥ 160	Or ≥ 100

Body mass index (BMI) is a simple index of weight for height used to classify overweight. body And obesity on person mature. BMI defined as a person's weight in kilograms divided by the square of their height in meters (kg/m2) (Abineno and Malinti, 2022).

For count Index Mass Body (BMI) required measure weight and height. For this reason, a tool is needed to measure weight and height body. Heavy body stated in unit kilogram And tall body squared.

Table 2. BMI Classification According to WHO

Classification	BMI
Heavy body not enough (underweight)	<18.5
Heavy body normal	18.5- 22.9
Excess heavy body (overweight)	
With risk	23- 24.9
Obesity I	25- 29.9
Obesity II	≥ 30

3. RESEARCH METHODS

Study This use design analytic observational , with approach *cross-sectional study* . Approach This done For evaluate connection Body Mass Index (BMI) with incident hypertension on elderly . Research This conducted at the Sail Health Center , Sail District , Pekanbaru City And study This implemented on month February 2025. Population patient is all over patients receiving treatment at the polyclinic elderly Sail Health Center , Pekanbaru City during period research . On its management done measurement tall body And heavy body as well as measurement tension use tensiometer , then done data processing for look for connection index mass body mass index (BMI) against incident hypertension on elderly at the Sail Community Health Center in Pekanbaru City .

4. RESULTS AND DISCUSSION

This study aims to determine the relationship between age and BMI. incident hypertension in Community Health Center Sidomulyo Care Stay Pekanbaru. This research was conducted at the Sidomulyo Inpatient Community Health Center in Pekanbaru. Population study This is all over patient The elderly who aged >46 years who are undergoing treatment in the Sidomulyo Health Center work area Care Stay Pekanbaru. Temporary That, collection The sample in this study used the *Accidental Sampling method* . The sample taken was 60 respondents.

Study done with use Inspection tall body using stadiometry, body weight using analog scales and blood pressure blood use tensiometer digital Which done in Sidomulyo Community Health Center Care Stay Pekanbaru. Before do inspection, The researcher first provided an explanation regarding this research to the patient and asked for their consent to become a respondent by signing the *informed consent form* submitted by the researcher.

Results

1. Univariate Analysis

a. Characteristics Respondents Based on Age And Type Sex

Table 3. Respondent Characteristics Based on Age and Gender

Characteristics	Frequency	Percentage
Age		
46-55 Year (Early Elderly)	17	28.3%

56-65 Year (Elderly End)	26	36.3%
>65 Year (Seniors)	17	28.3%
Gender		
Woman	27	45%
Man	33	55%

Based on Table 3, it can be seen that the majority of respondents were aged 56-65 years, amounting to 26 respondents (36.3%). Based on Type sex, most Lots respondents various sex man as many as 55 respondents (55%).

b. Respondents' Blood Pressure

Table 4. Frequency Distribution Based on Blood Pressure

Category Blood pressure	Frequency	Percentage
Normal	33	55.5%
Hypertension	27	45.5%

Based on Table 4, it can be seen that the majority of respondents are classified as hypertension as much as 27 respondents (45.5%) And pressure blood 33 respondents (55.5%) were normal.

c. Body Mass Index

Table 5. Frequency Distribution Based on Blood Pressure

Category BMI	Frequency	Percentage
Thin	2	3%
Normal	12	20%
Fat	15	25%
Obesity	31	51.7%

Based on Table 5, the majority of respondents had an obese BMI (31 respondents (51.7%), followed by 15 overweight respondents (25%), and 31 obese respondents (51.7%). Meanwhile, 12 respondents (20%) were in the normal category, and 2 respondents (3.3%) were in the thin category.

2. Bivariate Analysis

d. Cross Tabulation Test of Age and Gender Characteristics with Blood Pressure

Table 6. Frequency Distribution Based on Blood Pressure

Characteristics	Pressure Blood		Total
Age	Normal	Hypertension	
46-55 Years (Elderly Beginning)	8 (47.1%)	9 (52.9%)	17 (28.3%)
56-65 Years (Elderly End)	12 (46.2%)	14 (53.8%)	26 (43.3%)
>65 Years (Seniors)	7 (41.2%)	10 (58.8%)	17 (28.3%)

Total	27 (45.0%)	33 (55.0%)	60 (100%

Based on table 6, respondents dominated with category age 56-65 years (Late Elderly) namely 26 respondents (41.7%), of which 12 of them had normal blood pressure (46.2%) and 14 respondents aged 56-65 years were classified as hypertensive (53.8%).

Table 7. Cross Tabulation Test of Gender Characteristics with Blood Pressure

Characteristics	Pressure Blood		Total
Work	Normal	Hypertension	
Man	14 (42.4%)	19 (57.6)	33 (55.0%)
Woman	13 (48.1%)	14 (51.9%)	27 (45.0%)
Total	34 (56.7%)	26 (43.3%)	60 (100%)

Based on table 7, it can be seen that most of the respondents with type sex Man that is as much as 33 respondents (55.0%) with 19 of them having hypertension (57.6%), and 14 male respondents having normal blood pressure (42.4%).

e. Crosstabulation of Body Mass Index with Blood Pressure

Table 11. Cross Tabulation Test of Body Mass Index with Blood Pressure

Characteristics	Status Hypertension		Total
Index Mass Body (BMI)	Normal	Hypertension	
Thin	2 (100%)	0 (0.0%)	2 (3.3%)
Normal	9 (75.0%)	3 (25.0%)	12 (20.0%)
Fat	5 (33.3%)	10 (66.7%)	15 (25.0%)
Obesity	11 (40.7%)	20 (60.6%)	31 (51.7%)
Total	33 (43.3%)	27 (56.7%)	60 (100.0%)

Based on the table above, it can be seen that the majority of respondents have a normal Body Mass Index (BMI), namely 12 respondents. (20.0%), with 3 respondents own hypertension (25.0%), And 9 respondents own pressure blood normal (75.0%). Respondents with BMI obesity was 31 respondents (51.7%), with 20 of them having hypertension (64.5%) and 11 respondents having normal blood pressure (35.5%). Respondents with BMI Fat as much as 15 respondents (25.3%), with Among them, 10 respondents had hypertension (66.7%) and 5 respondents own pressure blood normal (33.3%). Respondents with Only 2 respondents (3.3%) had a thin BMI and had normal blood pressure. all (100.0%).

Discussion

1. Age and Gender of Patients at the Sail Health Center, Pekanbaru City

Based on the age that most people come to the Sail Health Center City Pekanbaru majority respondents aged 56-65 years old, totaling 26 respondents (36.3%). This research is in line with the theory that in the elderly age Indeed, the body has experienced a decline in organ function body due to the process aging that happened. The system immune as protector body even No Work as strong as when age young so that it is the reason why people who enter old age are susceptible to suffering from diseases, especially hypertension (Yunus, Aditya and Eksa, 2021).

The more age increase, happen change on arteries in The body becomes wider and stiffer, resulting in a reduced capacity and recoil of blood accommodated through the blood vessels. This reduction causes an increase in systolic pressure. Aging also disrupts neurohormonal mechanisms such as the renin-angiotensin-aldosterone system and increases peripheral plasma concentrations and the presence of aging-related glomerulosclerosis. And intestinal fibrosis result in improvement vasoconstriction and

vascular resistance, resulting in increased blood pressure (hypertension) (Nuraeni, 2019).

At the age of over 45 years, the walls of the arteries will experience thickening due to the accumulation of collagen in the muscle layer, so that the blood vessels... blood will gradually narrow And Also become stiff. Narrowed blood vessels due to increase Age affects blood circulation, resulting in increased blood pressure. This is in line with the theory that as age increases, blood pressure increases. change on arteries in body become more wide And rigid which results in blood capacity and recoil accommodated through the blood vessels decreases. With increasing age, blood pressure also increases (Nurhayati, Ariyanto, and Syafriakhwan, 2023).

Based on type sex Which most Lots come in The majority of inpatients at the Sidomulyo Health Center in Pekanbaru City are male. This research is in line with research (Rahmadhani, 2021) which explains that there is no relationship between gender and the prevalence of frequent illness. seeking treatment because gender is only a protective factor, especially in women, due to hormonal changes. This research is inconsistent with research by Salsabila *et al.* , 2023, which states that elderly Which often suffer hypertension usually experienced by women due to factor menopause Which influential on hormones. In addition That matter This can happen Because sample Which found researchers less diverse due to limited samples.

Furthermore, research (Garwahusada and Wirjatmadi, 2020) explains that men aged 18-59 years have a higher tendency to develop hypertension than women. The prevalence increases in postmenopausal women compared to postmenopausal women. with man on scope age Which The same. Matter This can be caused by existence difference hormone And style life. The vasoprotective mechanism carried out by the hormone estrogen is lost after menopause.

2. BMI and Hypertension at the Sail Community Health Center in Pekanbaru City

Being overweight is associated with risk factors that cause the occurrence Hypertension. Overweight individuals, with a 20% increase in body weight, have an eightfold increased risk of developing hypertension. BMI significantly impacts the incidence of hypertension, and excessive BMI is associated with higher risk factors for hypertension compared to BMI within the normal range (Abineno and Malinti, 2022).

Based on the research results, respondents who did not have hypertension were more dominant. compared to with respondents Which own pressure high blood pressure. Although the number of hypertension patients by 45.5% this figure exceeds the figure flat flat national For incident hypertension in Community Health Center Sidomulyo Inpatient Unit in Pekanbaru City. This may be due to sample limitations, resulting in a larger percentage. At the Sidomulyo Inpatient Health Center in Pekanbaru City, respondents had a BMI of overweight/obesity, which is more prevalent. Excessive BMI is a trigger for Which can life-threatening man. Matter This is mainly because obesity is associated with hypertension. Obese people's bodies will work hard. For burn excess calories Which enter. Burning calories This requires an adequate supply of oxygen in the blood. The more calories burned, the more oxygen supply in the blood. The number of supply blood Of course make heart Work more hard. The impact pressure blood person Which obesity the more high, so that hypertension can occur (Sukmawaty, 2022).

3. BMI of Hypertension Patients at the Sail Community Health Center in Pekanbaru City

Being overweight reflects a condition of excessive fat accumulation in the blood. High blood fat levels can potentially lead to plaque formation. Plaque buildup on blood vessel walls causes blood vessels to become stiff, thickened, and lose elasticity, thus reducing their ability to stretch and distend. This stiffening of blood vessels is called atherosclerosis. This stiffening of blood vessels causes resistance to blood flow, also known as peripheral resistance. This resistance to blood flow triggers the heart to contract. Work more hard so that flow blood can pass vessels the blood that pinch. The more narrow lumen vessels blood consequence plaque buildup so the more big also prisoners to flow blood. matter here it is which causes high blood pressure, because the blood vessels cannot stretch or distended moment flowing by blood, so happened high blood pressure or

hypertension (Sutrisno and Vegiawati, 2023).

Based on the research results, 46 respondents with overweight BMI had high blood pressure, a number that was higher than those with normal BMI. This study aligns with research (Rahayu *et al.* , 2020), which found that the majority of patients with hypertension were obese. Obesity is closely related to hypertension. During menopause, women have the same risk of hypertension as men due to hormonal changes where protective factors are no longer produced, and this is also supported by weight gain.

Based on table 9, hypertension patients At the Sidomulyo Community Health Center in Pekanbaru City, inpatients are dominated by elderly people > 55 years old. This is in line with research. (Salsabila *et al.* , 2023) who explained in his research age most most frequent suffer hypertension is at It occurs in both men and women between the ages of 56 and 65. It is explained that in old age, large arteries lose elasticity and become stiff, forcing blood flowing with each heartbeat into narrower vessels, leading to increased blood pressure. This in accordance with theory that is height hypertension in line With increasing age, this is caused by structural changes in large blood vessels, so that the lumen becomes narrower and the walls of the blood vessels become stiffer, resulting in increased systolic blood pressure. With increasing age, there is an increase in average diastolic blood pressure, although not very significant, there is also an increase in the prevalence rate. hypertension each increase group decade age (Sartik, Tjekyan and Zulkarnain, 2019)

4. The relationship between BMI and the incidence of hypertension at the Sail Community Health Center, Pekanbaru City

Obesity is one of the factors of hypertension. When someone experiences obesity or in say other own heavy body Which If there is excess, the person will need more blood to supply oxygen and food to the body's tissues, so that the volume of blood circulating through the blood vessels increases, cardiac output also increases, And Finally pressure blood follow increased. According to research on the increase mark BMI followed with increase pressure blood. It means the higher a person's BMI value then the opportunity the risk of developing hypertension is also higher (Herdiani, 2019).

Results from test *Chi-Square* correlation from data table on obtained *a p-value* of 0.03 (<0.05) Which means there is a relationship Which A significant correlation was found between body mass index and blood pressure of respondents. This study differs from other studies, such as those by Yulia, Siska, and Himawan (2021), which found a relationship between body mass index and blood pressure. In addition, this research is also in line with study (Niza Anggi Marlitayani Rizki *et al.* , 2023) Which The results of his research showed that body mass index (BMI) has a significant influence on the incidence of hypertension.

Research result this has similarities with research (Abineno and Malinti, 2022) where there was a relationship between BMI and the incidence of hypertension. Besides That The same with study (Sukmawaty, 2022) Which the results of his research show there is connection Which significant BMI with the occurrence of hypertension, where the higher a person's BMI, the higher the risk of developing hypertension.

Index Mass Body (BMI) as predictor obesity shows the high carbohydrate and fat content in the body which triggers the continuous accumulation of triglyceride fat deposits in the blood vessels. blood. Process This become beginning formation atherosclerosis, a condition in which fatty plaques build up on the walls of blood vessels, increasing the risk of hypertension (Niza Anggi Marlitayani Rizki *et al.* , 2023).

The mechanism by which obesity can lead to hypertension is linked to hyperinsulinemia and damage to blood vessel structure. In obese individuals, body fat, resulting from the accumulation of calories that are not optimally absorbed, accumulates in the form of visceral fat, which accumulates in various parts of the body, such as the abdomen. Excessive visceral fat, decreased leptin sensitivity, and cytokines infiltrating adipose tissue will result in an increase in intracellular free fatty acids, which can lead to hyperinsulinemia and insulin resistance. When insulin resistance occurs, nitric oxide decreases, resulting in vascular vasodilation, decreased salt sensitivity, and increased plasma volume, which together can lead to increased blood pressure or hypertension. Excessive fat intake will lead to an increase in free fatty acids in the body. This increase in

free fatty acids can increase blood glucose levels. Low Density Lipoprotein (LDL) blood, so that can triggers atherosclerosis which can cause blockages in blood vessels and cause hypertension (Melliya Sari *et al.* , 2023).

In someone with a BMI of overweight and obesity, blood pressure can increase. This is due to the increasing increase in blood pressure. heavy body so make amount fat in body more and more. If obesity And obesity This happen in time Which long time to get influence amount oxygen And flow blood Which will carries oxygen throughout the body. As a result, blood vessels enlarge, which also increases blood pressure. Excess weight can lead to the addition of fatty tissue and increased blood flow. Increased blood pressure can also caused by by improvement from rate heart And capacity blood vessels in transporting blood are reduced (Herdiani, 2019).

5. CONCLUSION AND SUGGESTIONS

It is hoped that community health centers and health workers, particularly village midwives and nutritionists, can motivate the community to visit the health center, conduct health promotion campaigns about the dangers of hypertension, early detection and intervention for obesity, and provide nutritional counseling for those of productive age. Future researchers are expected to conduct further research and address the limitations of this study, such as examining factors And variables other Which cause hypertension incidents .

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