OVERVIEW OF FASTING BLOOD GLUCOSE LEVELS IN HYPERTENSION PUSHERS IN THE WORKING AREA OF PUSKESMAS, EAST CITY

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ABSTRACT

Based on data from the Gorontalo Province Health Office in 2018, the city of Gorontalo was ranked third in cases of hypertension. Hypertension is a major risk factor for DM. The relationship with DM is very complex, Hypertension can make cells insensitive to insulin (insulin resistant) while insulin plays a role in increasing glucose uptake in many cells and in this way also regulates carbohydrate metabolism, so that if there is insulin resistance by cells, the sugar levels in the blood can also experience interference. This study aims to determine the description of fasting blood glucose levels in hypertension patients using the high, low and normal POCT method in the working area of the East City Health Center.

This research is a quantitative descriptive study with a total of 33 samples. Using a glucometer. This research is processed through the IBM SPSS Statistic V25.0 program then the data is presented in tabular form and reported as a percentage using the Frequency Distribution formula.

The results showed that the average high fasting blood glucose levels in hypertension sufferers were 15 (45.5%) whereas for hypertension patients who have low fasting blood glucose levels 0% for hypertension sufferers have normal fasting blood glucose levels 18 (54.5%), Suggestions are expected that people with hypertension maintain a regular diet, and for other researchers it is hoped that they can increase the number of samples and use other methods so that the results obtained are maximized.

Keywords: blood glucose, hypertension, POCT, insulin, diabetes mellitus

INTRODUCTION

Non-Communicable Diseases (PTM) is one of the major public health problems in Indonesia which until now has become a concern in the world of health because it is one of the causes of death. This is indicated by non-communicable diseases which are increasing globally in the world and nationally have occupied the top ten diseases that cause death and most cases, including hypertension.

Hypertension is an increase in blood pressure caused by the contracting heart so that blood continues to flow in the blood vessels, this force pushes against the artery walls (pulse). Blood pressure is expressed in two numbers, for example 120/80 mmHg. The number 120 is called the upper blood pressure (systolic) and the number 80 is called the lower blood pressure (diastolic). Systolic pressure shows the pressure on the arteries when the heart contracts, while the diastolic pressure is the pressure when the heart relaxes

Hypertension is a global health problem that can lead to increased morbidity and mortality. Even now,

hypertension is one of the main risk factors for cardiovascular disease. Hypertension is called the silent killer because it rarely causes symptoms and is undiagnosed [9].

Hypertension is difficult to detect by someone because hypertension has no special signs / symptoms. Symptoms that are easy to observe include mild symptoms, namely dizziness or headache, anxiety, reddish face, sore neck, irritability, ringing in the ears, difficulty sleeping, shortness of breath, heaviness in the neck, tiredness, dizzy eyes -nose, nosebleed (bleeding from the nose) [6].

Factors Affecting Hypertension

Uncontrollable risk factors

1. Gender, the prevalence of hypertension in men and women. Women are known to have lower blood pressure than men when they are 20-30 years old. But it will be easy to attack in women when they are 55 years old, about 60% suffer from hypertension affecting women. This is associated with hormonal changes in women after menopause [20].
2. Age, changes in blood pressure in a person will stably change at the age of 20-40 years. After that it tends to increase more rapidly. So, the older a person gets, the blood pressure increases. So an elderly person tends to have higher blood pressure than a young person
3. Heredity (genetic), the presence of genetic factors will certainly affect families who have suffered from previous hypertension. This is an increase in *intracellular sodium levels* and a *low ratio of potassium* to *sodium* in individuals so that the elderly tend to be at twice the risk of suffering from hypertension compared to people who do not have a family history of hypertension [3].
4. Education, education level indirectly affects blood pressure. The high risk of hypertension in low education, the possibility of a lack of knowledge in receiving information by health workers so that it has an impact on behavior or healthy lifestyle [2].

Controllable risk factors for hypertension

1. Obesity, in middle age and elderly, tends to lack of activity so that calorie intake balances energy needs, so that there will be an increase in body weight or obesity and will worsen the condition [1].
2. Lack of exercise. If you do regular exercise, it will be easy to reduce the increase in high blood pressure which will lower peripheral resistance, thus training the heart muscle to get used to doing heavier work due to certain conditions.
3. Smoking habits, smoking can increase blood pressure. This is because the nicotic content can cause constriction of blood vessels.
4. Excessive salt consumption, WHO recommends consumption of salt which can reduce the increase in hypertension. The recommended *sodium* level is no more than 100 mmol (about 2.4 grams sodium or 6 grams)
5. Drinking alcohol, when consuming alcohol in excess will cause an increase in blood pressure which is classified as severe because it can clog the blood in the brain and cause a stroke.
6. Drinking coffee, one cup of coffee contains 75-200 mg of caffeine, which in one cup of coffee can increase blood pressure by 5- 10 mmHg.
7. Anxiety, Anxiety will cause sympathetic stimulus which will increase heart rate, cardiac output and vascular resistance, this side effect will increase blood pressure. Anxiety or stress increases blood pressure by 30

mmHg. If the individual feels anxious about the problem he is facing then hypertension will occur to him. This is because repeated anxiety will affect the heart rate to speed up so that the heart pumps blood throughout the body faster.

Worldwide, there are approximately 972 million people or 62.4% of the population with hypertension, this figure will increase by 29.2% in 2025 [22]. Of the 972 million people with hypertension, 333 million are also in developed countries and 639 are in developing countries, including Indonesia

Meanwhile in Indonesia, the prevalence of hypertension based on the measurement results of the population aged 18 years was 34.1%, the highest was in South Kalimantan (44.1%), while the lowest was in Papua (22.2%). Hypertension occurred in the age group 31-44 years (31.6%), age 45-54 years (45.3%) aged 55-64 years (55.2%) [13].

In 2018, there were 1,627 people with hypertension in Pohuwato Regency, 1,754 people in Boalemo Regency, 1,134 people in North Gorontalo District, 7,276 people in Gorontalo District, 3,326 people in Gorontalo City and 4,053 in Bone Bolango Regency [5]. From the data obtained from the Gorontalo provincial health office, the city of Gorontalo is in third place in cases of hypertension.

Based on records and reports from the health information system of the East City Puskesmas, whose services include several urban villages, it shows that the incidence of hypertension sufferers in 2019 reached 1058 people.

Hypertension is a major risk factor for DM [7]. The relationship with DM is very complex, hypertension can make cells insensitive to insulin (insulin resistant) while insulin plays a role in increasing glucose uptake in many cells and in this way also regulates carbohydrate metabolism, so that if there is insulin resistance by cells, the sugar levels in the blood can also experience interference.

Glucose is the most important carbohydrate for the body because glucose acts as the main metabolic fuel. Glucose also serves as a precursor for the synthesis of other carbohydrates, for example glycogen, galactose, ribose, and deoxyribose. Glucose is the most end product of carbohydrate metabolism. Most of the carbohydrates are absorbed into the blood in the form of glucose, while other monosaccharides such as fructose and galactose are converted into glucose in the liver. Therefore, glucose is the largest monosaccharide in the blood [18].

Abnormalities that occur in blood glucose, namely:

1. Hypoglycemia, hypoglycemia is a clinical *syndrome* of low blood glucose, which is less than 50 mg / dl in men, and below 40 mg / dl in women. Too low a glucose level is just as dangerous as hyperglycemia. The body needs fuel to work. One of the main sources of fuel is glucose, which the body gets from what is consumed, both as simple sugars and complex carbohydrates.

   Of all the organs of the body, the brain is dependent on glucose almost exclusively, the brain cannot make glucose on its own and is 100% dependent on the whole body for the supply of nutrients. Diabetics can develop hypoglycemia due to taking insulin treatment or diabetes drugs, but then skip meals, too late eating, or eating very little. It could also be a side effect of diabetes medication, exercising too hard without enough food intake, or drinking too much alcohol.

   Symptoms of hypoglycemia that may appear include nervousness, sweating, hunger, trembling, weakness, palpitations, or difficulty speaking. In most patients with

diabetes they only experience hypoglycemia if they take medication or insulin. Symptoms give a person the opportunity to raise blood glucose levels before the brain is affected. In acute hypoglycemia, urgent medical attention is needed by providing a source of easily absorbed sugar such as juice, sugar water and the like. In general, 15 grams of glucose is the dose given, followed by a symptom assessment and a blood sugar check if possible.

2. Hyperglycemia

   The initial cause of diabetes is hyperglycemia, which is a condition of excessive blood sugar levels. In its early stages, hyperglycemia puts a person in pre-diabetes condition. If it is severe, diabetes will attack.

   Prediabetes is a condition in which blood sugar levels are higher than normal but not high enough to be considered diabetes. This condition is known as borderline diabetes.

Fasting Blood Glucose

Is a blood glucose level test in patients who fast for 8-10 hours. This glucose level can indicate the state of overall glucose balance or glucose homeostasis and routine measurements should be made of fasting glucose samples. Normal fasting glucose levels are between 70-130 mg / dl.

Glucometer (POCT)

Glucometer that uses the principle of *Point of Care Testing* (POCT) or also known as the Bedside Test is defined as a laboratory examination performed on patients outside the central laboratory, both outpatients and inpatients. POCT is generally divided into 2 categories based on its complexity, namely "*waive*" and *"non-waive*".

The puncture site for capillary blood collection is at the edge of the tip of the middle or ring finger [10]. Do not do a puncture in the middle of the fingertip, as it can hit the bone and vascularisasina less well. Stabbing is also not done on a finger that has previously been stabbed in the fingertip, which does not allow for a stabbing, such as in infants or in patients with burns, then the puncture is done on the heel.

Thus, from the results of previous research, it was found that the results of blood pressure checks with blood glucose levels in humans from 30 respondents who were examined, found 10 people (33.333%) of respondents suffering from hypertension and 20 people (66.67%) of other respondents whose blood pressure was normal. Meanwhile, for blood glucose levels, 17 people (56.67%) of respondents had glucose levels above normal and 13 people (43.33%) had normal glucose levels. The relationship between blood glucose levels is due to the fact that blood pressure affects glucose levels in human blood. By maintaining a normal value, blood pressure can prevent complications from diseases caused by high area pressure. Especially in maintaining the stability of glucose levels in the blood.

Based on the background description above, the researchers are interested in conducting research on the description of blood glucose levels in hypertension sufferers in the work area of the East City Community Health Center.

RESEARCH METHODS

This type of research is descriptive research, namely research with the aim of knowing the value of the variable without intending to compare or link it with other variables [11].

This research design is descriptive quantitative which aims to describe or describe a phenomenon or event (one or more research variables) in depth and systematically in the form of quantitative data (numbers), without looking for relationships or research variables. [17].

This research was conducted on October 10 to October 15, 2020, the sampling location was in the East City Health Center Work Area.

This research design is a descriptive design that studies the incidence and distribution of diseases or problems related to health, the process starts with the selection of subjects, data collection techniques, and data collection procedures. The variables of this study are independent variables, namely fasting blood glucose levels and hypertension sufferers.

Respondent Characteristics

The characteristics of the respondents in this study are:

1. Male and female gender
2. Age 40 years and over

The sampling technique was carried out by *purposive sampling*. *Purposive sampling* is a sampling technique with certain considerations or criteria [15]. In this study, the research sample came from hypertension patients with sample criteria.

1. The criteria to be studied are:
   a. Patient age 40-70 years.
   b. Male and female gender
   c. Respondents who live in the work area of the East City Health Center
   d. Hypertension sufferers are willing to be research subjects
2. The criteria not researched used were:
   a. Patient age under 40 years.
   b. Respondents who do not live in the work area of the East City Community Health Center
   c. Hypertension sufferers are not willing to be research subjects

The number of respondents in this study was calculated based on the sample size formula Malhotra [16]. as follows

Formula: $n = \frac{\sigma^2 Z^2}{D^2}$

Information:

n = many research samples

σ = population standard deviation (if absent, use sample standard deviation)

Z = standard unit value (Z table value determined from the% confidence coefficient)

D = expected accuracy value (confidence coefficient%)

Then:

σ = 2,2

Z = standard unit value (Z table) of 2.57

D = 99% or 0.99

$$n = = \frac{\sigma^2 Z^2}{D^2} \frac{(2,2^2)(2,57^2)}{0,99^2}$$

$$= \frac{(4,84)(6,6049)}{0,9801}$$

$$n = \frac{31,967716}{0,9801}$$

$$= 32,61679$$ or 33 samples

The population was all people with hypertension who came to check in the working area of Puskesmas Kota Timur as many as 1058 people.

The sample is a part of the population and the characteristics of the population, or a small part of the populationbreast milk taken from the population. The samples taken in this study were 33 hypertension patients who carried out the examination in the working area of the East City Health Center.

The research instrument is a tool used by researchers in collecting data so that workers are easier and the results are better [19]. The instrument used was a glucometer *EasyTouch* which is used as a measuring tool to determine the results of examination of fasting blood glucose levels in hypertension patients in the working area of the East City Health Center.

The tools and materials used at the time of the study were Autoclick, Lanset, *EasyTouch* glucometer, infectious waste containers, capillary blood samples, alcohol cotton, dry cotton, glucose strips. This research is processed through the IBM SPSS Statistic version 25.0 program

then the data is presented in tabular form and reported in a percentage using the Frequency Distribution formula as stated [15]:

$P = \frac{f}{N} x\ 100\%$

Information:

P = Percentage
F = frequency / number of samples of high, low and normal blood glucose levels
N = The total number of samples
100% = Fixed number

RESEARCH RESULT

This research was conducted in the Work Area of the Kota Timur Puskesmas and sampling was carried out in October 2020. The data collection process was carried out by means of interviews and physical examinations (blood pressure and fasting blood glucose) using *purposive sampling* technique. aims to determine fasting blood glucose levels in hypertension sufferers in the East City Health Center Work Area in 2020.

The results of examination of blood glucose levels in hypertensive patients in the working area of the East City Puskesmas are shown in table 1.

Table 1. Frequency Distribution of Hypertension Patients based on the results of fasting blood glucose levels

No.	Results of Glucose Levels Fasting Blood	Frequency	Percentage (%)
1	High	15	45.5
2	Low	0	0
3	Normal	18	54.5
	total	33	100.0

Source: Primary data, 2020

Based on Table 1. Frequency distribution of hypertension sufferers based on the results of fasting blood glucose levels shows that hypertension sufferers who have high fasting blood glucose levels are 15 people (45.5%,) while for hypertension patients who have low fasting blood glucose levels 0 (0%) and 18 people (54.5%) of hypertension sufferers who have normal blood glucose levels in the working area of Puskesmas Kota Timur.

Table 2. Frequency Distribution of Hypertension Patients by Age

No.	Age group	Frequency	Percentage (%)
1	40-50	14	42.4
2	51-60	12	36.4
3	61-70	7	21.2
	total	33	100.0

Source: Primary data, 2020

Based on Table 2, it shows that people with hypertension by age are 14 respondents with a percentage of 40-50 years with a percentage of 42.4%, at the age of 51-60 years there are 12 respondents with a percentage of 36.4%, at the age of 61-70 years there are 7 respondents with a percentage of 21.2 %.

Table 3. Distribution of Frequency of Hypertension Patients by Gender

No.	Gender	Frequency	Percentage (%)
1	Women	20	60.6
2	man	13	39.4
	total	33	100.0

Source: Primary data, 2020

Based on Table 3, it shows that most of this study were female, namely as many as 20 respondents (60.6%,) while men were 13 respondents (39.4%).

DISCUSSION

In the study, the description of blood glucose levels in hypertension patients was based on 33 respondents in the working area of the East City Health Center. This research was conducted with a *purposive sampling* technique, where this study aims to determine the results of examining fasting blood glucose levels in hypertension patients in the work area of the Kota Timur Puskesmas using the POCT method in October 2020.

1. Results of examining fasting blood glucose levels in hypertension sufferers

   Hypertension is a degenerative disease that still suffers most commonly in society. Hypertension occurs due to many factors where it can start from genetics and lifestyle. In addition, blood sugar levels are used as a reference for DM in Indonesia. The high prevalence of hypertension has 4-5 times the risk of causing death and stroke. Therefore, blood pressure needs to be controlled closely to avoid complications. Based on The United Kingdom Prospective Diabetes Study (UKPDS), every 10 mmHg decrease in systolic blood pressure will reduce the risk of complications in blood glucose by 12%, death related to DM 15%, myocardial infarction 11%, and macrovascular complications by 13%.

   The results of the study were obtained from the examination of fasting blood glucose levels from 33 samples of hypertension sufferers, 15 (45.5%) had high fasting blood glucose levels, and those who experienced low fasting blood glucose levels were (0%) while for hypertension patients who had high Normal blood glucose was 18 people (54.5%). The results showed that most respondents had fasting blood glucose levels within normal limits.

   The results of this study are in line with the results of the study which stated that there was no significant relationship between fasting blood sugar levels and hypertension. [12]. As with the theory that has been obtained, diabetes that is continued without treatment will cause damage to blood vessels and an increase in fat accumulation in the walls of blood vessels. Thus increasing the risk of narrowed blood vessels due to clogged. As a result, the heart has to work even harder to pump blood. so that blood pressure will rise in diabetics [8].

   The effect of insulin resistance in diabetic patients itself can also make the body fail to absorb glucose in the blood for energy or fat storage. This condition results in increased body fat. The accumulation of fat in the body can interfere with the work of the nervous system, including the signals that regulate blood pressure. In addition, insulin resistance triggers an imbalance in salt and potassium levels which causes an increase in body fluid volume. This can also cause narrowing of the arteries, which over time raises blood pressure to the risk of hypertension.

   Long-term diabetes has a severe impact on the cardiovascular system. Hyperglycemia in diabetic patients in the macrovascular system in the endothelial lining of the arteries results in increased permeability of endothelial cells so that molecules containing fat enter the arteries. Endothelial cell damage will trigger an inflammatory reaction so that eventually there is deposition of platelets, macrophages and fibrous tissue. Thickening of the arterial walls causes hypertension which further damages the endothelial lining of the arteries [4].

2. Results of examination of fasting blood glucose levels in hypertension sufferers based on age

   It was found that the trend of increasing prevalence according to

increasing age and at age 40 years the risk of hypertension increases with age, this is due to changes in the structure of large blood vessels so that the lumen becomes narrower and the walls of the blood vessels become stiffer. So the result is an increase in blood pressure.

For every decade increase in age in a person who has passed the age of 30, fasting blood glucose levels will increase by about 1-2 mg / dL [21]. The older a person is, the higher the risk of increased blood glucose levels and impaired glucose tolerance. This is caused by the weakening of all the functions of the body's organs, including the pancreatic cells which are responsible for producing insulin.

The results obtained in this study showed that out of 33 respondents, the results of fasting blood glucose levels in hypertensive patients were found to be the largest number, namely those aged 41-50 as many as 14 people (42.4%), age 51-60 as many as 12 people (36.4%) and age 61. -70 for 7 people.

Increasing age affects a person's blood glucose levels. In the results of the research conducted, it was found that respondents who experienced hyperglycemia tended to be more likely to be at the age of 41-60 years compared to respondents who were under 40 years old. This shows the results that are in line with research conducted by Sum Transport in 2013 on 43 research respondents who found 24 respondents aged 41-60 years with high blood glucose levels and diabetes mellitus sufferers. The theory says that as you age, the ability of your tissues to take up blood glucose decreases.

3. Results of examination of fasting blood glucose levels in hypertension sufferers based on gender

The research conducted showed that more women experienced high fasting blood glucose levels than men, namely 20 respondents (60.6%) and 13 men (39.4%).

research shows that in prevalence of women and men have the same chance of developing diabetes, women are more at risk because physically women have a greater chance of increasing body mass index [14]. Monthly cycle syndrome (premenstrual syndrome), post-menopause, which makes the distribution of body fat easily accumulate due to this hormonal process, so that women are at risk of an increase in blood sugar. Besides depression can also trigger an increase in blood sugar. Men and women also differ in dealing with a stressor. Men are sometimes less emotional, so they prefer to directly solve the problem at hand or face the source of stress directly.

CONCLUSION

Based on the results of examining fasting blood glucose levels in hypertensive patients in the working area of the East City Health Center, it can be concluded that:

1. High fasting blood glucose levels (45.5%), low fasting blood glucose levels (0%), and normal fasting blood glucose levels (54.5%).
2. The results of the examination of fasting blood glucose levels in hypertensive patients in the working area of the East City Health Center showed that more tests showed normal levels, namely (54.5%). compared with high yields (45.5%).

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