

# Factors Contributing To Blood Glucose Levelstype II DM Patients

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## Abstract:

*Hyperglycemia chronic in patients with diabetes can cause long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. The main problem of diabetic patients is the difficulty in regulating blood sugar levels. Many factors can affect the level of blood glucose in patients with type II DM. This study aims to determine the factors associated with the level of blood glucose in patients with type II DM study design used is descriptive-analytic with approach cross. The population in this study were all patients with type II DM who went to the clinic of Internal medicine DrSoerdjoTashkmalaya at the time of the study. The number of respondents in this study is 66 people. The results show that there is a difference in blood glucose levels average in patients who are on a diet adhering and are not on a diet, there are difference in the blood levels of the average diabetic patient are routinely carried out and those that do not, and there is a score between level of anxiety. On the blood glucose level of diabetic patients.*

**Keywords:** *Type II diabetes mellitus, blood glucose, diet, exercise, anxiety*

## 1. INTRODUCTION

Diabetes is a group of metabolic diseases characterized by hyperglycemia that occurs as a result of disturbances in secretion of insulin, action of insulin, or both. Hyperglycemia chronic in patients with diabetes can cause long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels.(1).

Based on a survey by the World Health Organization (WHO), Indonesia is in number the fourth largest people with diabetes mellitus (DM). This figure reached 8.6% of the total population and is expected to continue to grow along with lifestyle changes, especially because the diet is not balanced (2). In addition to the increasing number of patients, another thing that must be considered in diabetes mellitus is the danger of the complications that can arise if blood sugar is not controlled.

Who explained that the DM is one of the four priorities for diseases of non-communicable diseases (PTM) and the main cause of blindness, heart attack, stroke, kidney failure, and amputation of the feet. In the year 2015, has already reached 415 million adults with diabetes, increased 4-fold from 108 million in the 1980s, it is estimated the figure is 642 million. Much of this increase will occur in developing countries and will be due to population growth, aging, unhealthy diet, obesity, and sedentary life style. In the year 2025, while most people with

diabetes in developed countries will be 65 or older, in developing countries most will be in the 45-64 age group and will be affected in the years of their most productive(3).

As conditions in the world, diabetes is now one of the biggest causes of death in Indonesia. Health research Data base (at risk) indicates that there is increase in diabetes in Indonesia of 5.7% in 2007 to 6.9% or around 9.1 million in 2013. Sample Data Survey 2014 showed that diabetes was the cause of death. the third largest in Indonesia with a percentage of 6.7%, after a Stroke (21.1%) and Coronary Heart Disease (12.9%). If not treated, this condition can cause the reduction of productivity, disability, and premature death(4).

Based on data from the Medical Records of the Hospital Dr. SoekardjoTasikmalaya in 2017, it was found that the number of cases of diabetes Mellitus to achieve an incidence of 334 people, with the average patient 455 years and 204 more patients compared with 130 patients.

Diabetes requires proper care so as not to cause more severe complications. In principle, diabetes therapy aims to normalize insulin activity and blood glucose levels to reduce the occurrence of vascular complications and neuropathic. The goal of therapy for each type of diabetes is to achieve normal blood glucose levels without hypoglycemia and serious disturbances in the activity patterns of the patient. There are five components of diabetes management, diet, exercise, monitoring, therapy if necessary, and education(5).

Blood glucose level is a parameter that indicates a condition of hyperglycemia or hypoglycemia. In DM patients, this hyperglycemic condition is greatly influenced by many factors. Some of the factors associated with increased blood glucose levels include gender, age, hereditary history, diet, or diet that is not balanced(6). Physical exercise is one of the five main pillars of diabetes mellitus management. Physical exercise can improve blood glucose control in type 2 DM patients, reduce cardiovascular risk, help lose weight, and improve the well-being of DM patients(7). Physical exercise can lower blood glucose levels because physical exercise will increase the use of glucose by active muscles(8). Regular aerobic physical exercise in diabetics can improve insulin sensitivity and reduce cardiovascular risk. Walking, cycling, jogging, and swimming are aerobic exercises. The frequency of exercise is done at least 3-4 times per week. Regular physical exercise can lower HbA1c levels(6).

In addition to physical exercise, diet is the main thing that DM patients must do to control glucose levels in the blood. Unstable blood glucose levels were found in DM patients with poor diet compliance. DM patients need to be emphasized on the importance of regular meal schedules, the type and amount of calorie content, especially in those who use drugs that increase insulin secretion or insulin therapy itself.(6). Apart from the two things mentioned above, in concept, age, gender, level of anxiety, including blood pressure can affect the stability of blood glucose levels in Type II DM patients. Therefore, researchers are interested in further researching the factors that contribute to blood glucose levels in Type II DM patients.

## **2. LITERATURE REVIEW**

### **Diabetes mellitus**

Diabetes mellitus is a group of metabolic abnormalities that have the characteristics of increasing levels of glucose in the blood (hyperglycemia) that occurs due to impaired insulin secretion, impaired insulin action or both. Meanwhile, according to(9), it is said that Diabetes is a chronic and progressive disease characterized by the inability of the body in the metabolism of carbohydrate, fat and protein resulting in increased blood glucose levels (hyperglykemia).

### **Pathophysiology**

In type II DIABETES there are two main problems related to insulin, namely insulin resistance and impaired insulin secretion. Insulin resistance leads to decreased sensitivity of tissues to insulin. Normally, insulin binds to special receptors on the cell surface and initiate a series of reactions of glucose metabolism. In type 2 diabetes, the reaction of intracellular is reduced, the

influence of insulin becomes ineffective on the stimulation of glucose uptake by the tissues. The real mechanism that leads to insulin resistance and impaired insulin secretion in type 2 diabetes is not known, although genetic factors are thought to have a role.

Type 2 Diabetes, generally occurs at the age above 30 years with obesity. Because it is related to the circumstances that slowly (chronic), glucose intolerance progressive, the emergence of type 2 diabetes is sometimes not detected in some years. When symptoms are experienced, they often complain of fatigue, irritabilitas, poliuri, polydipsia, skin wound difficult to heal, vaginal infections, or a gloomy view of (when blood sugar levels are very high) (10).

### **Treatment**

Main goal of diabetes therapy is to try to normalize insulin activity and blood glucose levels in an effort to reduce the occurrence of complications of vascular and neuropathic. The purpose of therapeutic in every type of diabetes is to achieve normal blood glucose levels without occurrence of hypoglycemia and serious disturbances on the patterns of client activity. There are five components in the management of diabetes, ie diet, exercise, monitoring, therafi if necessary and education. Diet and weight control are the foundation of the management of diabetes(11).

Physical exercise is useful for controlling blood sugar levels, lowering the risk of cardiovascular disease, lose weight, make you happy and confident and improve your quality of life. Before performing physical exercise, DM patients perform a medical evaluation to identify the possible presence of the problem micro and makroangiopati that can be worsened with physical exercise. The type of exercise that is recommended is aerobic, rhythmic, recreational and moderate such as gymnastics, jogging, swimming and cycling. The information needs to be delivered is the examination of the blood sugar before and after physical exercise, eat and drink before performing the physical exercise, provide a food source of glucose such as snack, candy and stop doing exercise if you feel dizzy, weak and sweating a lot(11).

Pharmacologic intervention is added if the target blood glucose level has not been achieved with settings of eating and physical exercise. Pharmacological interventions include: Oral Hypoglycemic Drugs (OHO) and / or insulin. Monitoring blood glucose levels independently (SMBG; Self-Monitoring of Blood Glucose), allows patients with DM can detect and prevent hypoglycemia and hyperglycemia, and play a role in determining the levels of glukoa normal blood which is likely to reduce long-term diabetes complications.

### **3. METHODOLOGY**

The research design used was descriptive with a cross-sectional approach. This research was conducted at Dr. SoekardjoTasikmalaya. The sample size was 66 respondents who were selected using purposive sampling. This study is intended to analyze the factors that affect blood glucose levels in type II DM patients. Sampling was done by consecutive sampling and obtained 66 respondents who fit the criteria. the inclusion criteria of this study sample were Type II DM patients, received oral anti-diabetic drugs, routinely went to the hospital, and were willing to become respondents. The inclusion criteria of this study were metabolically unstable conditions.

The research instruments used to see the characteristics of the respondents include initials, age, gender, dietary adherence, exercise habits / physical activity, habits of checking blood glucose, blood pressure, anxiety. The measured blood glucose was blood glucose when the patient visited the RSU Dr. SoekrdjoTasikmalaya, using a glucostick and recorded in mg/dl units of measurement. Blood pressure is measured using an electric tensimeter, the results are recorded in the form of systolic pressure in mmHg. Anxiety is measured using the HARS scale and the results are expressed in a scoring form. Data collection activities were carried out using interview and questionnaire methods. This study only involved respondents who were willing to be involved consciously and without coercion. Before the research was carried out, the researcher explained the objectives, benefits, and procedures of the study to the respondents. Furthermore, the

researcher asked the respondent's consent to be involved in the research. After the respondent agrees, the respondent is asked to sign a letter of approval to become the respondent. Researchers apply ethical principles in conducting this research. Data processing is done by editing, coding, data entry, and cleaning. Data that has been processed will then be analyzed. Researchers apply ethical principles in conducting this research. Data processing is done by editing, coding, data entry, and cleaning. Data that has been processed will then be analyzed. Researchers apply ethical principles in conducting this research. Data processing is done by editing, coding, data entry, and cleaning. Data that has been processed will then be analyzed.

The analysis used in this research is univariate analysis to describe each of the variables namely age, gender, diet compliance, physical exercise, monitoring of blood glucose, blood glucose levels before and after the intervention. Before the bivariate analysis, the normality test was carried out for numerical variables. The results of the normality test showed that the variables of age and systolic blood pressure were normally distributed, while anxiety and blood glucose were not normally distributed, so data analysis was performed using non-parametric tests.

**4. RESULT AND DISCUSSION**

**Table 1 Distribution of Respondents by Age, Systolic Blood Pressure, Anxiety, Blood Glucose in Dr. SoekardjoTasikmalaya**

Variable	Mean	SD	Min - Max	95% CI
Age	54.52	7.05	35 - 68	52.76 - 56.54
Blood pressure	141.06	15.89	137.16 - 144.97	202.78 - 253.56
Worry	8.80	5.7	1 - 20	7.40 - 10.21
Blood Glucose	228.17	103.28	82 - 592	202.78 - 253.56

Based on table 1 above, it can be seen that the mean age of the respondents is 54.52 years, the average systolic blood pressure is 141.06 mmHg, the average anxiety score is 8.8 and the average blood glucose is 228.19 mg/dl.

**Table 2 Distribution of Respondents by Gender, Compliance with Diet, Checking Blood Glucose Levels and Physical Activity in Dr. SoekardjoTasikmalaya**

VARIABLES	TOTAL	%
<b>Gender</b>		
1. Male	27	40.9
2. Women	39	59.1
<b>Diet compliance</b>		
1. Yes	30	45.5
2. Not	36	54.5
<b>Physical Activity</b>		
1. Yes	44	66.7
2. Not	22	33.3
<b>Routinely Check Blood Glucose</b>		
1. Yes	23	34.8
2. Not	43	65.2
<b>TOTAL</b>	<b>52</b>	<b>100</b>

Based on the data in table 2 above, it can be seen that most of the respondents are female (59.1%), most of the respondents adhere to a diet (54.5%), most respondents routinely perform physical activities (66.7%) and most respondents ( 65.2%) routine check blood glucose levels.

**Table 3 Correlation Analysis of the Relationship between Age, Blood Pressure and Anxiety Score with Blood Glucose**

VARIABLES	P-Value
Age	0.77
Blood pressure	0.43
Anxiety Score	0.03

Table 3 above shows that there is no relationship between age and blood glucose levels, and there is no relationship between systolic blood pressure and there is a relationship between anxiety scores and blood glucose levels.

**Table 4 Distribution of Average Blood Glucose levels based on gender, physical activity, diet compliance, and habits of checking blood glucose levels**

Group	Mean	SD	SE	p-Value
Male	235.07 mg / dl	100.39	19.32	0.625
Women	223.38 mg / dl	106.26	17.03	
Doing Physical Activities	208.02	106.28	16.02	0.0005
Do not do	268.09	855.92	18.32	
Diet	135.07	35.22	6.43	0.002
Not Diet	290.75	99.59	16.59	
Routine Check	217.91	106.39	22.18	0.0005
No Routine Check	233.65	10.24	15.62	

Table 4 shows clearly that there is no difference in the mean blood sugar of the sexes of men and women (p-value 0.625) and there is a difference in the average blood glucose levels of respondents who do physical activity and do not routinely do physical activity (p-value 0.0005). There is a difference in the average blood glucose levels of respondents who adhere to the diet and those who do not comply with the diet (p-value 0.002) and there is a difference in the average blood glucose levels of respondents who routinely carry out blood glucose checks and those who do not routinely carry out level checks blood glucose (p-value 0.0005).

## 5. DISCUSSION

### a. Age

The results showed that the average age of the respondents was over 50 years. This is by the concept of the theory that in old age, especially more than 50 years, insulin resistance occurs. This insulin resistance causes a decrease in insulin sensitivity, which causes an increase in blood glucose levels. This is exacerbated by decreasing the ability of muscle and fat tissue to increase glucose "uptake", a mechanism that causes blood glucose levels to continue to rise.(12). This is in line with the results of the Basic Health Research (Riskesdas) in 2018 which showed that DM cases increased with age(13).

The condition of Hyperglycemia experienced by patients with type II DIABETES caused by insulin resistance and impaired insulin secretion. Insulin resistance leads to reduced tissue sensitivity to insulin. Typically, the insulin bound to specific receptors on the surface of the cell and initializes a series of reactions for glucose metabolism. In type 2 diabetes, the reaction of intracellular is reduced, the effect of insulin becomes ineffective to stimulate glucose uptake by the tissues. The exact mechanism that causes insulin resistance and impaired insulin secretion type 2 is not known, and the age is estimated to be one of the factors associated with increased insulin resistance.

From various studies, it was agreed that blood glucose levels have a strong relevance with increasing age. Reduced glucose tolerance, especially in the elderly, is associated with reduced sensitivity of peripheral cells to insulin (insulin resistance). Age can increase the incidence of type II diabetes because aging can reduce insulin sensitivity so that it can affect glucose levels in the blood. The individual will experience a progressive shrinkage of pancreatic beta cells. Generally, humans experience a physiological decline that dramatically decreases rapidly at the age of 40. Increasing age or the aging process in humans causes a decrease in protein synthesis, a decrease in body mass and bone mass, and an increase in body fat percentage.(14),(15).

In contrast to the researchers, the results showed no relationship between age and blood glucose levels. Researchers say that the age group of respondents who were respondents in this study varied greatly from the youngest age range of 35 years and the oldest 68 years old, with an average respondent being 54 years old. Insulin resistance that occurs due to an increase in age is more common in patients with the elderly category (over 65 years). Kalyani& Egan's research(16)explained that diabetes and impaired glucose tolerance predominantly affect older adults. The aging process can be associated with changes in glucose metabolism, relative insulin resistance, and islet cell dysfunction of Langerhans. In the elderly, there is abnormal glucose metabolism. The goals of diabetes treatment in the elderly include controlling hyperglycemia, preventing and treating diabetes complications, avoiding hypoglycemia, and maintaining the quality of life.(16).The increased risk of diabetes goes hand in hand with the increase in age, especially at the age of 40 years, because at that age there is an increase in glucose intolerance. The aging process reduces the ability of pancreatic  $\beta$  cells to produce insulin. Also, some individuals are older decreased mitochondrial activity in muscle cells by 35%. This is related to increase in fat levels in the muscles by 30% and lead to insulin resistance.

## **b. Gender**

Results of research conducted by Akshay(17)shows that women tend to have diabetes because it is associated with the presence of the monthly cycle syndrome (premenstrual syndrome) and postmenopausal make the distribution of fat in the body more easily accumulate because of the hormonal processes so that women are more at risk of diabetes mellitus in DM type II. In people with diabetes aged more than 40 years, their vital organs are weakened and the sensitivity to insulin decreased, and in women who have experienced menopause tendency to insulin sensitivity decreased. Insulin sensitivity decrease is what causes the high blood glucose levels. in addition to that physically, women have a greater chance to increase the body mass index. Syndrome monthly cycles (premenstrual syndrome), post-menopause which makes the

distribution of body fat is easy to accumulate because the process of this hormone so that women at risk of experiencing elevated levels of blood glucose(18).

Blood sugar levels women is higher than the levels of men in the United. This means the risk of glucose tolerance (GTG) in American women is higher than men. Similarly, in Indonesia, women in Indonesia have a higher risk of glucose tolerance (GTG) than men, because of the level of physical activity of Indonesian women are lower than men, and women, it is known that the composition of body fat is higher than men. - The male. The composition of the high fat cause women to be more susceptible to obesity and this is associated with risk of glucose tolerance (GTG).

This is different from the results of the analysis of the research conducted, this study shows that there is no difference in the average blood glucose levels of male respondents and female respondents. Research Atami, et.al(19)states that Type II diabetes is a complex metabolic disease characterized by impaired glucose tolerance. Apart from the high environmental risk factors, genetic background is a strong component affecting glucose tolerance. Although the study showed that there was a difference between the tolerance of blood glucose levels between male and female respondents, they concluded that they were all about the role of genetic factors controlling glucose tolerance, which differed significantly between the sexes.

Although most studies show that there are differences in blood glucose levels between men and women, where women tend to have higher blood glucose levels than men, in terms of prevention efforts, women have higher precautions in carrying out various efforts controlling blood glucose levels. A study was conducted to see the differences in interventions in blood glucose control between men and women. The results of the study show that women are more concerned with gaining or gaining weight and showing strong efforts to control weight, as well as seeking medical assistance for weight loss therapy. This is a good attempt,(20). This statement is different from the results of Unden, et.al's study which showed that women with Type II DM have a worse quality of life than men, therefore it is very important to identify the best strategy in managing female patients who experience DM(21).

### **c. Diet Compliance**

Diet and weight control are the basis of diabetes management. dietary compliance is one of the keys to success in the management of type 2 diabetes mellitus. This is because meal planning is one of the main pillars in the management of type II diabetes mellitus.(22). Diet is the key to successful management of type 2 diabetes. The better a person's diet, the possible blood glucose will below. The Diet aims to help people with type 2 Diabetes Mellitusimprove your eating habits so that they can control the level of glucose, fats, and blood pressure. Patients with type II diabetes required to comply with the rules of the diet, to control the level of glucose in their blood. Regulation of the Diet is an important component of management of diabetes.A person with diabetes will improve their health by controlling body weight, blood glucose levels, and the use of insulin as a hormone to regulate the levels of blood glucose. The regulation of these nutrients, including dietary modification for the intake of nutrients normal to control the blood glucose level and blood fat. The purpose of diabetes mellitus diet is to maintain or achieve weight ideal body, maintain blood glucose levels near normal to prevent acute complications and improve the quality of life of patients with chronic.(22).

The results showed that dietary adherence affected blood glucose levels. This is in line with research conducted by Russel, et.al(23)which states that dietary management is an important thing that should be considered by patients with type II diabetes. The seriousness of the patients in the control diet greatly affects the blood glucose level of the patient. The type of food consumed day-to-day associated with fluctuations in blood sugar levels daily patients. Components of the diet have significant effects and clinically on the fluctuations on the blood glucose level. An integrated approach that includes reducing excess body weight, increasing physical activity along with the adjustment of the diet to regulate blood glucose level not just

will be the advantages in the management of type II DIABETES but also will benefit public health and to limit the increase in the level of inkulasi of type II DM in the whole world.

Blood glucose level is a parameter that indicates a condition of hyperglycemia or hypoglycemia. Patients with Type II diabetes need to be emphasized on the importance of regular meal schedules, the type and amount of calorie content, especially in those who use drugs that increase insulin secretion or insulin therapy itself. Muctachorro's research results(24)show that there is a relationship between dietary adherence and blood glucose levels in Type II DM patients so that proper intervention is needed so that Type II DM patients always adhere to the diet to control blood glucose levels.

#### **d. Physical Activity**

Physical exercise is useful for controlling blood sugar levels, reducing the risk of cardiovascular disease, losing weight, creating a sense of pleasure and confidence, and improving the quality of life. Before doing physical exercise, DM patients carry out medical evaluations to identify possible micro-problems and macroangiopathies that can worsen with physical exercise. The recommended types of exercise are aerobic, rhythmic, recreational, and moderate such as gymnastics, jogging, swimming, and cycling. Information that needs to be conveyed is checking blood sugar before and after physical exercise, eating and drinking before doing physical exercise, providing food sources of glucose such as snacks, candy, and stopping exercising if you feel dizzy, weak, and sweating a lot.(12).

Physical activity is any movement of the body produced by the necessary skeletal muscles energy. Lack of physical activity is an independent risk factor for chronic disease and is estimated to cause overall death globally.8 Walking, casual cycling, jogging, and swimming are all aerobic exercises. The frequency of exercise is done at least 3-4 times per week. Regular physical exercise can reduce HbA1c levels. Doctor's advice to patients with pre-diabetes and with normal glucose levels to increase physical exercise by 59.1% and 24.2%, respectively this is because when doing physical exercises, muscles active muscles move so that no insulin is needed to enter glucose into the cells because, inactive muscle, receptor sensitivity insulin becomes increased so that the uptake of glucose to the muscles increases and automatically decreases glucose levels in the blood. The results of Korompis' research indicate that there are differences in blood glucose levels between respondents who do aerobic exercise and those who do not. Physical exercise can reduce body fat and can automatically increase insulin sensitivity which will increase glucose uptake to muscles and reduce blood glucose levels.(25).

This is in line with the results that the researchers found that there is a difference in the average blood glucose levels of respondents who routinely do physical activity and who do not regularly do physical activity. The physical activity carried out regularly and continuously by DM patients has a good impact on controlling blood glucose levels. Levels high blood glucose can be controlled by doing physical activities regularly. Inactivity of the physical and obesity is a critical risk and modified. Individuals are not active are more likely to have blood glucose levels abnormal than active individuals. A study of the follow-up of diabetes patients in Daqing, China, shows that physical activity reduces the intervention of diabetes by 43%, and diabetes prevalence is delayed by 3.6 years.(26).

#### **e. Habit of checking blood glucose**

The results show that there is a difference in the level of blood glucose, the average patients who routinely check the levels of blood glucose and those who rarely check the blood glucose levels. By monitoring blood glucose levels independently (SMBG; self-monitoring of blood glucose), diabetic patients can now set their therapy to control blood glucose levels optimally. This allows the detection and prevention because of hypoglycemia and hiperlycemia as well as play a role in determining the levels of blood glucose normal that are likely to reduce long-term diabetes complications.(5).A variety of methods are now available for self-monitoring of blood glucose

levels. Most of these methods involve a drop of blood from your fingertip, apply blood to the strip special, and then leave the blood on the strip for some time.

The results of this study are in line with Machry's statement (27) which explains the results of a systematic review that shows that monitoring blood glucose levels by DM patients can provide better glycemic control. Regular and independent monitoring of blood glucose levels was proven to reduce HbA1C levels in 12 weeks. Decreasing levels of HbA1C has been shown to significantly reduce blood glucose levels in DM patients.

DM sufferers can live normally by controlling the various risk factors that can be modified so that the possibility of various long-term and short-term complications can be overcome. According to the Consensus of Control and Prevention of Type 2 DM in Indonesia in 2011, representing healthy behavior *self-management* DM patients, among others, follow a healthy diet, increase physical activity, use DM drugs and drugs in special circumstances safely and regularly, monitor blood sugar levels, and carry out regular foot care. DM management aims to control blood sugar levels to remain within limits normal to prevent acute and chronic complications. The phenomenon that occurs is the lack of compliance with DM sufferers in controlling their blood glucose. As many as 75% of DM patients eat not as recommended and 77% monitor and interpret blood sugar incorrectly. Only 21.4% of DM sufferers monitor their blood sugar well (28).

Independent management at the DM in aspects of nutrition and drug therapy is good, but not good in physical exercise and monitoring blood glucose levels. Other studies have shown that only 25,5% of the respondents monitor their blood sugar well. An individual's ability to regulate life and control day-to-day and reduce the impact of disease they are known as self-management, that is to follow a healthy diet, increase physical activity, use of medicines DIABETES and medicines in special conditions secure and regularly, monitoring blood sugar levels, as well as foot care regular. Some studies have reported that there are still some diabetic patients who monitor their blood sugar well. The results of the research Fajrunni the sunnah stated that the supporting actor to check the blood glucose level is the psychological, social, economic, and access factors. Barriers to participating in checking the blood glucose is quite complex, including psychological, social, education, drug use, behavior against the disease, and perception of health Insurance. (28).

#### **f. Blood pressure**

The results show no relationship between blood pressure and blood glucose levels. In the concept, high blood pressure affects the system homeostatik the human body. High blood pressure, one of which can be affected by high levels of glucose in the blood, which clog the blood flow in fiber, ending with the effect of increased blood pressure. Pressure of blood exerted on the walls of the arteries of the heart. Peak pressure occurs when the ventricles contract and is called the systolic pressure. Diastolic pressure is the lowest pressure that occurs when the heart is resting. Blood pressure with adult values usually range from 100/60 mmHg to be 140/90 mmHg. Normal blood pressure is usually 120/80 mmHg (5).

Some of the factors that cause an increase in blood pressure include age, race, gender, exercise, blood volume, and blood viscosity. Blood viscosity is the thickness of blood as a liquid that contains many chemical elements. Blood viscosity is influenced by hematocrit, if the hematocrit increases, blood viscosity also increases. Also, the condition of increasing blood glucose levels is one of the causes of increased blood viscosity. The viscosity of the blood increases so it takes more energy to pump blood over a certain distance and the flow will be slower. The reason is that the friction that occurs between the various layers of blood and vessels increases so that blood pressure also increases (5), (29).

Although in theory it was found that blood pressure was related to the condition of the blood glucose level of DM patients, in this study there was no correlation between the two things.

Adler, et. al stated in their study that the trust of the complications of the clinical in patients with type II DM was significantly related to blood pressure a systematic, except for the extraction of cataract. Every 10 mm Hg drop in systolic blood pressure associated with a reduction of 12% in the risk for related complications. The study concluded that the complications of diabetes is strongly associated with increased blood pressure. A decrease in blood pressure tend to reduce the risk of complications, with the lowest risk in those who have blood pressure systematically less than 120 Mm Hg(30).

#### **g. Anxiety**

The results showed that there was a relationship between the respondent's blood glucose level and the anxiety level scoring of Type II DM patients. Physiological stress, such as infection and surgery, facilitates hyperglycemia, and can trigger hyperglycemia, and can also lead to diabetes ketoacidosis (DKA) or HHNS. Emotional stress can negatively impact diabetes. When you experience stress, the hormones that lead to increased blood sugar will rise, especially when food and insulin intake is not changed. Also, during emotional stress, patients with diabetes may change their eating, exercise, and medication habits. This worsens hyperglycemia or hypoglycemia conditions (for example in patients taking insulin or oral antibiotics who stop eating in response to stress)(5).

A person with diabetes should be aware of the potential for diabetes relapse that accompanies emotional stress. They should be encouraged to try to plan management for example when stress occurs, what to do. Also, learning strategies to minimize stress and coping with stress are important aspects of health education for diabetes patients.

Anxiety is a response to stressful situations. Anxiety can be categorized into, namely mild, moderate, severe, and panic. Mild anxiety is usually associated with tension in daily life, this causes a person to become alert and increase alertness. Moderate anxiety can allow a person to focus on important issues and put others aside so that a person experiences selective attention but can do something purposeful. Severe anxiety experienced by a person can narrow the field of perception so that he cannot think about anything else. Panic is related to the shock, fear, and terror of experiencing a loss of control. A person who is panicking is unable to do something even in the direction.

Physiological responses to anxiety include increased blood pressure, palpitations, palpitations, increased pulse, decreased pulse pressure, shock, and others. In the respiratory system, there are changes in rapid and shallow breathing, a feeling of pressure in the chest, a feeling of choking. The skin feels hot or cold on the skin, pale face, sweating all over the body, burning sensation on the face, sweaty palms, itching. Gastrointestinal will complain of anorexia, abdominal discomfort, burning in the epigastrium, nausea, diarrhea. And the neuromuscular system can cause increased reflexes, shock reactions, eye flickering, insomnia,(31).

Dewi's research results (32)proved that emotional stress can cause hyperglycemia. This condition is related to limitations in the regulation of physiological mechanisms resulting in disruption of carbohydrate metabolism. This pathophysiological mechanism may be related to physiological regulation errors. Anxiety can increase blood sugar levels even though the HBA1c is weak. Stress can increase the ACTH hormone which will activate the adrenal cortex to secrete glucocorticosteroid hormoneswhich will increase gluconeogenesis so that blood sugar levels will increase. Stress stimulates the HPA axis and causes changes in several hormones, increased serum cortisol concentrations and reduced sex hormones and insulin activity, and increased blood glucose.(32), (5), (5).

## **6. CONCLUSION**

The results of this study indicate that the average age of the respondents is 54.52 years, mean systolic blood pressure 141.06 mmHg, mean anxiety score 8.8, and mean blood glucose at the

time of 228.19 mg/dl. Most of the respondents were female (59.1%), most respondents adhered to a diet (54.5%), most of the respondents routinely performed physical activities (66.7%) and most respondents (65.2%) routinely checked glucose levels blood.

The results showed a relationship between anxiety level scores and blood glucose levels, there was a difference in the average blood glucose levels of respondents who did the physical activity and did not regularly do physical activity (p-value 0.0005), there was a difference in the average blood glucose levels at respondents who obeyed to do a diet and who were not obedient to diet (p-value 0.002) and there was a difference in the average blood glucose level of respondents who routinely performed blood glucose checks and those who did not regularly check blood glucose levels (p-value 0.0005).

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18. Sari N, Purnama KA. Aktivitas Fisik dan Hubungannya dengan Kejadian Diabetes Melitus Article history : form 17 October 2019 Universitas Muslim Indonesia Accepted 20 October 2019 Address : Available Email : Phone : PENDAHULUAN darah yang disebut hiperglikemia dengan gangguan metabolisme karbohidrat , lemak , dan protein yang disebabkan karena kerusakan

dalam produksi insulin dan kerja dari insulin tidak optimal . Diabetes terjadi karena kelainan sekresi insulin , kerja insulin , atau kedua-duanya . 1 peningkatan setiap tahun di negara-negara seluruh dunia . Diabetes melitus merupakan salah satu Diabetes Melitus Tipe 2 . Diabetes melitus Tipe 2 adalah penyakit gangguan metabolik yang ditandai fungsi insulin ( resistensi insulin ). 2 manusia dan peningkatan biaya kesehatan yang cukup besar , maka sangat diperlukan program mengurangi faktor risiko diabetes tersebut , pemerintah telah mengeluarkan aturan tentang kandungan No . 208 / 1985 tentang Pemanis Buatan dan Permenkes No 722 / 1988 tentang bahan tambahan. 2019;2(4):368–81.

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