

Hubungan Densitas Energi Diet, Asupan Karbohidrat, Serat, Tingkat Stres dan Kadar Glukosa Darah Puasa pada Pasien Diabetes Melitus Di Puskesmas Kecamatan Kebon Jeruk

The Relationship Between Dietary Energy Density, Intake Of Carbohydrate, Fiber, Stress Level and Fasting Blood Glucose Level in Diabetes Melitus Patients In Puskesmas Kebon Jeruk Subdistrict

Siti Aminah, Mertien Sa'pang, Anugrah Novianti, Kharizka Citra Palupi, Harna.

Program Studi Gizi, Fakultas Ilmu-Ilmu Kesehatan, Universitas Esa Unggul

Jl. Arjuna Utara Tol Tomang Kebon Jeruk, Jakarta 11510

sitiamiinahsa@gmail.com

ABSTRAK

Menurut Riskesdas tahun 2013 gula darah puasa terganggu 36,6% dan toleransi glukosa terganggu 29,9%. Prevalensi DM yang di diagnosis oleh dokter sebesar 2,1%. Hal ini diakibatkan dari pola makan yang tidak baik, yang mengandung tinggi lemak, gula dan rendah serat yang akan memengaruhi kadar glukosa darah puasa. Penelitian ini bertujuan untuk mengetahui adanya hubungan densitas energi diet, asupan karbohidrat, serat, tingkat stres dan kadar glukosa darah puasa pada DM tipe 2. Desain yang digunakan adalah *cross-sectional*. Pengambilan sampel dilakukan dengan teknik *Purposive Sampling*, sampel dalam penelitian ini adalah pada pasien DM tipe 2. Analisa data ini menggunakan uji *Rank Spearman* dan *Uji Pearson*. Hasil penelitian menunjukkan bahwa ada hubungan densitas energi diet ($p = 0,002$), ada hubungan asupan karbohidrat ($p = 0,001$), ada hubungan tingkat stres ($p = 0,001$), depresi ($p = 0,015$), kecemasan ($p = 0,000$) dan kadar glukosa darah puasa pada pasien diabetes melitus tipe 2. Tidak ada hubungan asupan serat ($p = 0,065$) dan kadar glukosa darah puasa. Perlu adanya edukasi kepada pasien terkait pola pikir.

Kata kunci : Asupan karbohidrat, asupan serat, densitas energi diet, kadar glukosa darah puasa, tingkat stres.

ABSTRACT

According to Riskesdas in 2013, impaired fasting blood glucose is about 36.6 % and impaired glucose tolerance is 29.9%. prevalence DM that has been diagnosed by doctor is 2.1%. this is caused by bad eating pattern where it contains high fat and sugar also low fiber that will affect fasting blood glucose level. This study aims to find out the relationship between dietary energy density, intake of carbohydrate, fiber, stress level and fasting blood glucose level in type 2 DM. This study used cross-sectional design. Sampling was done by Purposive Sampling Technique. The sample in this research was type 2 DM patients. The analysis used Rank Spearman and Pearson Test. The result of the research shows that there was a association dietary energy density ($p = 0,002$), there was a relation intake of carbohydrate ($p = 0,001$), there was a relation stress level ($p = 0,001$), the depression ($p = 0,015$), the anxiety ($p = 0,000$) and fasting blood glucose level in patients with DM type 2. There was not association between intake of fiber ($p = 0,065$) and fasting blood glucose level. Education is needed for patients related with mindset, food selection which allowed and not for DM type 2 patients.

Keyword: Intake of carbohydrate, intake of fiber, dietary energy density, fasting blood glucose level, stress level.

INTRODUCTION

In this era of globalization, it occurs very rapidly from infectious diseases, which tend to non-communicable diseases (PTM).⁵ DM is a public health problem that almost occurs throughout the world. The number of DM sufferers globally is increasing every year. The most common type of diabetes mellitus is type 2 DM. The prevalence of DM in the world is 415 million, estimated by 642 million in 2040.¹² The proportion of diabetes mellitus is almost 80% in low and middle income countries, mortality rates in regional regions Southeast Asia is under 70 years. Whereas according to the data published by the incidence of DM in Indonesia, the highest seventh order in the world is predicted to increase the number of DM patients from 8.4 million in 2000 to around 21.3 million in 2030.²⁴

The prevalence of DM in Indonesia for age ≥ 15 years is 6.9% with the proportion of DM in urban areas that is equal to (6.8%) and rural (7.0%) while Impaired Fasting Blood Glucose by 36.6% and TGT 29.9%. The prevalence of DM that has been diagnosed by doctors has increased from 1.1% in 2007 to 2.1% in 2013. The highest prevalence is in Yogyakarta 2.6%, DKI Jakarta 2.5%, North Sulawesi 2.4% and East Kalimantan 2.3%.¹⁸ This shows that Jakarta is one of the provinces with the highest prevalence rates of DM after Yogyakarta. From the poly outpatient data at Puskesmas Kebon Jeruk Subdistrict, West Jakarta, the total number of patients diagnosed in DM in 2016 was 16.67%, in men was 14.7% and in women was 18.35%. The number of visits of patients diagnosed with type 2 DM in the last 3 months amounted to 2019 people and the average visit of visits per month was 670 people.

The incidence of complications in DM is affected by poor blood glucose control. One indicator of blood glucose control is fasting blood glucose levels. Monitoring of blood glucose levels is very important because blood glucose is an indicator to determine the diagnosis of DM. Impaired Fasting Blood Glucose Tolerance (TGDPT) depending on the results obtained: fasting blood glucose between 100-125 mg / dl.¹⁴ Blood glucose levels in elevated DM can be caused by several factors such as poor diet.¹⁵

The habit of consuming large amounts of energy density and carbohydrate served in traditional and modern food can lead to an increase in excessive energy intake which can increase the incidence of obesity which leads to

the incidence of DM.¹⁰ In adolescents who consume a low quality diet with high consumption of high energy density foods can have an impact on increasing BMI at risk of overweight and obesity, so that there is a high chance of developing DM type 2.⁷ The habit of consuming more energy density such as high-fat, low-fiber foods and less physical activity can risk DM type 2.²² The risk of developing diabetes is 24% greater in women who consume high dietary energy density compared to women who consumed a low dietary energy density, women with a waist circumference more than 88 cm were 9% to 12% more likely to develop diabetes than women with a waist circumference of 88 cm.

The amount of carbohydrate intake from main foods and interrupts affects the increase in blood glucose levels and insulin secretion, so that the higher the carbohydrate intake, the higher the blood glucose level and causes DM type 2.⁸ Carbohydrate intake has a positive effect on blood glucose levels in people with DM type 2. this means that the higher the level of adequacy of carbohydrates consumed, the higher a person's blood glucose level.²⁷ A person who has a high carbohydrate intake is at 3.85 times higher risk of experiencing DM type 2.² In line with the 2012 Paruntu study, people with more carbohydrate intake have a 12 times greater risk of not being able to control blood glucose levels so that it is higher to experience DM type 2.

Crude fiber contains low calories, low glucose levels and low fat can help reduce obesity, people who have low fiber consumption habits with nutritional status of obesity can be at risk of developing DM type 2 by 10.7 times while in people who have the habit of consuming fatty animal protein sources that is 4.9 times.²⁵ Similar to Amanina's 2015 study of someone with low fiber intake, the risk was 2.5 times higher for developing DM type 2. Eating fiber less than 25 grams per day could increase blood glucose so that can risk DM type 2.⁴ This is similar with Maulina's 2013 study of people who consumed low fiber 7.98 grams per day less than the recommended number > 25 grams per day, so the lower fiber intake, the higher blood glucose levels and the risk of DM type 2.

Stress is also a factor that appears in patients with DM. Feelings of shame, fear, anxiety, and anger are other forms of emotion. Stressful life can trigger a person's blood glucose level to increase.²³ People who experience stress have a 1.67 times risk of developing DM type 2

compared with people who do not experience stress.³ In line with Izzati's 2015 study that someone with severe stress levels 9 times the chance to experience an increase in blood sugar levels, compared to people who experience moderate stress levels. People who experience severe stress levels can trigger increased blood sugar levels in the body, so that the higher the stress experienced by DM sufferers, the more severe DM will worsen.⁶ Based on this background, researchers are interested in knowing the relationship of energy density diet, intake of carbohydrates, fiber, stress levels with fasting blood glucose levels in Puskesmas Kebon Jeruk subdistrict.

MATERIALS AND METHODS

The research was analytic observation research with cross sectional design. This study was conducted in August 2018 in a non-communicable disease clinic at the Puskesmas Kebon Jeruk, West Jakarta. Sampling was done by purposive sampling technique. The sample in this study were DM type 2 patients as many as 70 patients.

Collection of fasting blood glucose data using ACC-CHEK measurement Performance measured by nurses in Pusekesmas Kebon Jeruk subdistrict, the blood tested was peripheral (fingertip). The energy density of the diet is obtained from the total food and beverage energy per day divided by the weight of food a day,

which is obtained by conducting direct interviews using 2x24 hours food recall form. The value of carbohydrate intake is obtained from the total carbohydrate intake of food consumed daily, which is obtained by conducting interviews directly using 2x24 hours food recall form. The value of fiber intake is obtained from the total intake of dietary fiber consumed daily, which is obtained by conducting interviews directly using 2x24 hours food recall form. While the stress level was measured using the DASS (Depression Anxiety Stress Scale) questionnaire consisting of 42 items and carried out by direct interview.

The collected data is processed using a data processing application program. Statistical analysis used in this study is spearman correlation test if the data is not normal and Pearson correlation if the data is normal. Spearman and Pearson correlations are used to find relationships or test significant associative hypotheses between two or more variables.

RESULTS

The study was conducted on 70 samples of DM type 2 patients. Data collection was carried out at Puskesmas Kebon Jeruk subdistrict in West Jakarta in August 2018. The results showed the distribution of respondents based on the dependent variables and the independent variable (Table 1).

Table 1. Respondent Sistribution Based on Variables

	Variabel	n	Mean ± SD	Min-Max
Independent	Fasting Blood Glucose Level (mg/dl)	70	203,06±55,15	122-330
Dependent	Dietary energy density (Kkal/gr)	70	2,16 ±0,21	1,7-2,6
	Intake of Carbohydrate (gr)	70	252,82±53,38	139,2-413
	Intake of Fyber (gr)	70	9,24±4,35	3.5-22,2
	Stress Level			
	Stress	70	22.10±2.91	16-28
	Depression	70	6.34±3.45	2-16
	Anxiety	70	14.81±3.13	9-22

Table 1 shows the results of research conducted at the Puskesmas Kebon Jeruk Subdistrict. From 70 respondents, the average distribution of fasting blood glucose levels of patients is 203.06 ± 55.151 , with the lowest distribution of fasting blood glucose levels was 122 and highest 330. The average distribution value for diet energy density variable is $2.16 \pm 0,21$ Kcal / gr, with the lowest distribution of dietary energy density values is 1.7 Kcal / gr and

the highest is 2.6 Kcal / gr. In the variable carbohydrate intake has an average distribution value of 252.82 ± 53.38 gr, with the lowest distribution value of carbohydrate is 139.2 gr and the highest is 413 gr. The average distribution value for fiber intake variable is 9.24 ± 53.38 gr, with the lowest distribution value of fiber intake is 3.5 gr and the highest distribution was 22.2 gr. The average distribution of values for stress variables is 22.10 ± 2.9 with the lowest

distribution of stress was 16 and the highest is 28. Depression variable has an average distribution value of 6.34 ± 3.45 with the lowest distribution of values is 2 and the distribution of the highest

value is 16. The anxiety variable had a flat distribution value Average about 14.81 ± 3.13 . The distribution of depression level has the lowest value of 9 and the highest value is 22.

Table 2. The Relationship Between Independent Variable and Dependent Variables

Variable	Fasting Blood Glucose		
	n	Correlation (r)	P-Value
Dietary Energy Density	70	0,366	0,002
Intake of Carbohydrate	70	0,376	0,001
Intake of Fyber	70	0,222	0,065
Stress	70	0,377	0,001
Depression	70	0,290	0,015
Anxiety	70	0,429	0,000

The results of Pearson correlation of dietary energy density with fasting blood glucose levels have a correlation value about 0.366, means the closeness of the relationship between energy density and fasting blood glucose levels has a weak relationship. When looking at the direction of the relationship between these two variables, the number 0.366 is a positive number, it means that the direction of the two is in the same direction, ie if the energy density of the diet increases, the blood glucose level also increases. The value of p Value = $0.002 \leq 0.05$, which means that there is a significant relationship between dietary energy density and fasting blood glucose levels.

Pearson correlation test results of carbohydrate intake with fasting blood glucose levels has a correlation value of 0.376 which means that the relationship of carbohydrate with blood glucose level has a weak relationship. When looking at the direction of the relationship between the two, the value of $r = 0.376$ is a positive number, which means the direction of the two is in the same direction. If carbohydrate intake increases, blood glucose will also increase. The value of p Value = $0.001 < 0.05$ which means there is a significant relationship between carbohydrate intake and fasting blood glucose levels.

The results of the Spearman rank test of fiber intake with fasting blood glucose levels had a correlation value of $r = 0.222$ which means that the relationship of fiber intake with blood glucose levels has a very weak relationship. When looking at the direction of the relationship, the value of $r = 0.222$ is a positive number, which means that the direction of the two is in the same direction, if the fiber intake increases, the blood glucose level will increase. The value of p Value

= $0.065 > 0.05$, which means there was no significant relationship between fiber intake and fasting blood glucose levels.

The results of the Spearman rank test between stress and fasting blood glucose levels have a correlation value of 0.377, that is means the closeness of the relationship between stress and fasting blood glucose levels has a weak relationship. When looking at the direction of the relationship between these two variables, the number 0.377 is a positive number, meaning that the direction of the two is in the same direction, that is, if stress increases, the blood glucose level also increases. P value Value = $0.001 < 0.05$ which means there is a significant relationship between stress levels and fasting blood glucose levels.

The results of the Spearman rank test between depression and fasting blood glucose levels have a correlation value of 0.290, meaning the closeness of the relationship between depression and fasting blood glucose levels has a weak relationship. When looking at the direction of the relationship between the two variables, the number 0.290 is a positive number, it means that the direction of the two is in the same direction, that is, if depression increases, the blood glucose level also increases. Value p Value = $0.015 < 0.05$ which means there is a significant relationship between the level of depression and fasting blood glucose levels.

The results of the Pearson correlation test on anxiety and fasting blood glucose level has a correlation value of 0.429, that means that the closeness of the relationship between anxiety and fasting blood glucose level has a moderate relationship. When looking at the direction of the relationship between these two variables, the number 0.429 is a positive number, that is means

the direction of the two is in the same direction, that is, if the anxiety level increases, the blood glucose level also increases. The value of p Value = $0,000 < 0,05$, which means there is a significant relationship between the level of anxiety and fasting blood glucose levels.

DISCUSSION

The results of research conducted on DM patients showed that most had fasting blood glucose levels high on average 203.06 ± 55.15 mg / dl. The lowest distribution of fasting blood glucose levels is 122 mg / dl and the highest distribution is 330 mg / dl. Not in accordance with normal fasting blood glucose level which is < 110 mg / dl, medium 110-125 mg / dl, while the level of GDP is not good ≥ 126 mg / dl. 26 This is because the patient's food intake contains high energy density, the excessive carbohydrate intake and stress levels, depression, respondent anxiety in severe stress categories. Poor diet causes abnormal fasting blood glucose levels.⁶ Fasting blood glucose levels are not normal because of poor patient dietary attitudes.⁷ Patients who adhere to a diabetic diet according to eating rules for DM patients, often consult a doctor, do physical activities regularly, avoiding stress and obediently taking diabetes drugs can cause fasting blood glucose levels not to increase.¹³

The results showed the distribution of the mean value of dietary energy density is 2.16 ± 0.21 Kcal / gr. This value shows that it is in the high category (> 2.09 kcal / gr) .¹⁷ Based on the 2x24 hour recall results it is happened because patients like to consume fatty and coconut milk such as lontong sayur, nasi goreng, nasi uduk, bakwan, risol, mie goreng, bihun, opor ayam, daging rendang, semur daging, kopi dan teh manis. Eating high-energy density foods will produce excessive energy intake, so that it can be associated with increased intake consumed by these factors which can cause excess body composition and being overweight leading to degenerative diseases such as DM.¹¹ Eating fried foods that contain high fat, lack of consumption vegetables and fruits, causing high dietary energy densities.²⁷ The risk of developing diabetes is 24% greater in women who consume a high dietary energy density compared to women who consume a low energy density diet, women with a waist circumference > 88 cm are 9% to 12% more risk large diabetes compared to women with a waist circumference of 88 cm.

Carbohydrate intake was carried out by 2x24 hours recall, showing the distribution of the average value about 252.82 ± 53.38 gr with the lowest value of 139.2 gr and the highest value was 413 gr. While carbohydrate intake is recommended for people with diabetes mellitus below 65% of total energy. This is because patients eat two types of carbohydrates like rice with noodles, rice with potatoes and rice noodles with rice.

Reduction of carbohydrate intake can increase insulin sensitivity in healthy individuals and decrease in fasting blood glucose levels in type 2 DM patients. Arora et al in 2005. The amount of carbohydrate intake from main foods and interrupts affects an increase in blood glucose levels and insulin secretion, so the higher carbohydrate intake the higher blood glucose levels and cause diabetes mellitus type 2.^{8,27} A person who has a high carbohydrate intake has a risk of 3.85 times higher to experience DM.²

Fiber intake was carried out by 2x24 hours recall, showing a partial average of 9.24 ± 4.35 gr. The lowest distribution of fiber intake is 3.5 gr and the highest distribution is 22.2 gr. Fiber intake is not in accordance with the 2013 AKG which is 25-30 gr / day. because patients rarely consume vegetables and fruit, most patients lack information about the importance of eating vegetables and fruits and foods that are allowed, restricted and not permissible regarding DM type 2. Poor fiber intake and uncontrolled blood glucose because they rarely consume fruits and vegetables. Foods with high fiber can limit excessive energy consumption because usually high-fiber foods will have low energy values so they have a long digestion time. And foods with high fiber can provide a feeling of fullness longer because fiber in food can absorb water and expand so that it will slow down the rate of movement of food. And fiber can slow down the handling of blood glucose so that the insulin needed to convert glucose to a little (slow digestion and absorption of KH) so there is no increase in fluctuating blood glucose levels.²¹

The results showed that the average stress level of patients is 22.10 ± 2.91 , the lowest distribution of stress levels is 16 and the highest distribution is 28 in the category of severe stress level. The distribution of the average value of 6.34 ± 3.45 , the lowest distribution of depression is 2 to the highest 16, means being in the category of moderate depression. The average distribution of anxiety values is 14.81 ± 3.13 , the lowest distribution is 9 until the highest

distribution is 22, it means that in heavy categorization, it can be concluded that the higher the level of stress, depression and anxiety, the fasting blood glucose level will increase. From the interview results, the average patient is 56 years old who is in the elderly where there is a change in the life of the elderly, for example changes related to work or retirement, changes in social roles in society that affect health problems, pressure from illness, patients who do not work admitted that he often cared for his grandchildren, and patients who worked admitted that it was very difficult to rest. Patients who are in the severe stress category because most patients have stepped on the early elderly and the late elderly are partly where the elderly will generally experience physical and cological and social decline that interact with one another.⁶

Based on the results of Pearson Correlation statistical tests on DM patients in Puskesmas Kebon Jeruk Subdistrict, it was found that the contribution of dietary energy density with fasting blood glucose level has a significant relationship, has a strong relationship with a positive value $p \text{ Value} = 0.002 < 0.05$ with a large correlation ($r = 0.366$), it means that the higher the energy density of the diet consumed, the fasting blood glucose level will increase. The results of this study indicate a significant relationship between dietary energy density and fasting blood glucose level. Based on 2x24 hours recall, the contribution of dietary energy density shows that it is in the high category ($> 2.09 \text{ kcal / gr}$), that is, the average food consumed is fatty and coconut milk such as lontong sayur, nasi goreng, nasi uduk, bakwan, risol, mie goreng, bihun, opor ayam, daging rendang, semur daging, kopi dan teh manis. The excessive energy density contribution of the diet is due to the fact that there are still many DM patients in Puskesmas Kebon Jeruk Subdistrict which lack knowledge, lack of education from doctors and nutritionists. Based on the results of the interviews it was found that almost all DM patients were outpatient because the fried and sweet foods were more tasty.

This is not in line with the EPIC-Interact study in Europe of dietary energy density intake, this is because the average patient runs a diet well and consumes more vegetables and fruits. This research is in line with Lestari, foods that have high or medium energy density values such as mie goreng or mie instant, fried foods, martabak manis, bread, biscuits, are more delicious foods. This is in line with the study of Wang et al.,²²

intake of dietary energy density is due to patients on average consume high fat intake, low fiber intake such as fruits and vegetables, on average patients eat less fruits and vegetables with lower energy density. The results of this study prove that the consumption of dietary energy density is very influential on increasing blood glucose level.

Based on the results of the Pearson Correlation statistical test on DM patients in Puskesmas Kebon Jeruk Subdistrict, it was found that the contribution of carbohydrate intake with fasting blood glucose levels has a significant relationship, has a strong relationship with positive values $p \text{ Value} = (0.001 < 0.05)$ with large correlation ($r = 0.376$), it means that the higher the intake of carbohydrates consumed, the fasting blood glucose level will increase. The results of this study indicate a significant relationship between carbohydrate intake and fasting blood glucose levels. Based on a 2x24 hour recall, the contribution of carbohydrate intake showed to be in the high category ($> 60\% / \text{day}$), patients often consumed two types of carbohydrates such as nasi goreng with mie, rice with instant noodles / boiled noodles, rice with sambel kentang / balado and kuetiau with noodles. The contribution of excessive carbohydrate intake is due to the large number of DM patients at Puskesmas Kebon Jeruk Subdistrict who lack knowledge about the 3J principle, namely the meal schedule, the number of calories consumed, and the types of food that is permitted, restricted and not allowed so that the average patient does not go on the correct diet.

This study is in line with Fitri and Wirawani's research⁸, this is due to excessive carbohydrate intake of patients and lack of physical activity. The more excessive food intake, the greater contracting DM Type 2. This occurs because the body is unable to store and use glucose, so that blood glucose levels are affected by the high intake of carbohydrates eaten. so it can be concluded that someone who has high carbohydrate intake is at 3.85 times higher risk of experiencing DM.²

Based on the results of Rank Spearman statistical test on DM patients in Puskesmas Kebon Jeruk Subdistrict Health, it was found that the contribution of fiber intake with fasting blood glucose levels had no significant relationship, with values ($0.065 > 0.05$) with weak correlation and positive direction ($r = 0.222$), it means that the higher the intake of fiber consumed, the fasting blood glucose level will increase.

Although the results of the Spearman analysis statistical test there is no significant relationship between fiber intake and fasting blood glucose levels, but epidemiologically fiber is a complex carbohydrate-shaped food. Food fiber cannot be digested and is not absorbed by the human digestive tract but has a function that is very important for human health.¹⁹ Foods with high fiber will have low energy values so that they have a long digestion time, can provide a feeling of fullness longer because of fiber in food able to absorb water and expand so that it will slow down the rate of feed. And fiber can slow down the handling of blood glucose so that the insulin needed to convert glucose to a little (slow digestion and absorption of KH) so there is no increase in fluctuating blood glucose levels.²¹ Thus, there is no significant relationship between fiber intake with blood glucose levels because intake of fiber that is consumed by patients less than recommended is 25-30 grams / day.¹ From the results of interviews that almost the average patient said less like to eat vegetables and nuts because some patients have a history of gout, and for fruit this is due to the high price of fruits so that the patient is very less consuming fruit, this is evidenced by the average fiber consumption of 3.5-22.2 g / day.

Similarly with Nurgajayanti's research, there was no relationship between fiber intake and fasting blood glucose levels because it rarely consumed vegetables and fruits, most of the patients had already done nutritional consultations but the patients claimed not to have a full diet. According to Wiardan²⁵ people who have low fiber consumption habits with obesity nutritional status can be at risk of developing DM by 10.7 times while in people who have a habit of consuming fatty animal protein sources is 4.9 times. This is in line with the research of Amanina², a person with low fiber consumption, which is 2.5 times higher risk for developing DM.

Based on the results of Rank Spearman's statistical test on stress levels, DMD in Puskesmas Kebon Jeruk Subdistrict found that stress levels and fasting economic levels had a significant relationship, had a strong relationship with positive values $p = 0.001 < 0.05$ with large correlation ($r = 0,377$). Depression and fasting money levels have a significant relationship, have a strong relationship with a positive value $p = 0.015 < 0.05$ with a large correlation ($r = 0.290$). Based on the results of statistical analysis Pearson Correlation While based on the level and

economic level has a significant relationship, has a strong relationship with a positive value p Value = ($0.000 < 0.05$) with a large correlation ($r = 0.429$) the higher the level of depression that occur then the levels fasting blood glucose will increase.

The results of this study indicate a significant relationship between levels of stress, depression, anxiety and fasting blood glucose levels. Based on the DASS 42 item questionnaire. From some questions there is an average distribution of the lowest stress 16 to the highest is 28 meaning that in the category of severe stress, the average distribution of the lowest depression value 2 to highest 16 means being in the category of moderate depression, the average distribution of the lowest anxiety value is 9 to the distribution the highest is 22 which means that in a heavy categoric, it can be concluded that the higher the level of stress, depression and anxiety, the fasting blood glucose level will increase. From the interview results, the average patient is 56 years old who is in the elderly where there is a change in the life of the elderly, for example changes related to work or retirement, changes in social roles in society that affect health problems, pressure from illness, patients who do not work admitted that he often cared for his grandchildren, and patients who worked admitted that it was very difficult to rest.

This study is in line with Derek⁶ that there is a relationship between stress levels and blood glucose levels, this is because patients experience family pressure and problems. According to Irfan and Wibowo's research shows there is a relationship between stress levels and fasting blood glucose levels, this is because most patients with low education do not complete elementary school, do not work, suffer from DM for 1 year so the coping mechanism or adapt them is still very low. This is in line with Pramesti research¹⁶ that there is a relationship between the level of depression with fasting blood glucose levels, this is due to physical changes, fatigue, low income, poor perception of the illness, uncontrolled emotional, pressure from the family so glucose levels increase. This is in line with Suciati's research²⁰, this is due to the pressure from the illness that is not cured, family problems that can add to the burden of his mind. The incidence of depression in patients with diabetes is 1.4-3 times greater than non-diabetics. This happens because when in a state of stress the patient experiences appetite changes, more energy consumption is eating foods high in

calories and fat, People who experience stress have a risk of 1.67 times to suffer from DM compared with people who do not experience stress. Izzati W. & Nirmala research¹³ shows that a person with severe stress levels has a 9 times chance to experience an increase in blood sugar levels, compared to people who experience moderate stress levels.

CONCLUSIONS AND RECOMENDATIONS

There is a significant relationship between dietary energy density, carbohydrate intake, stress level, depression, and anxiety on fasting blood glucose levels. While on the variable fiber intake there was no significant relationship to fasting blood glucose levels in type 2 DM patients in Puskesmas Kebon Jeruk Subdistrict . People who either have diabetes mellitus or not, must pay close attention to a healthy lifestyle, adhere to the advice of nutritionists and doctors. Recommendation for Puskesmas Kebon Jeruk subdistrict to further enhance collaboration with nutritionists and provide education on the principle of 3j.

REFERENCES

1. AKG. (2013). *Angka Kecukupan Gizi Energi, Protein, Yang Dianjurkan Bagi Bangsa Indonesia* . Jakarta: Peraturan Menteri Kesehatan Republik Indonesia Nomor 75 Tahun 2013.
2. Amanina, A., Bejo, R., & Setyo, N. F. (2015). Hubungan Asupan Karbohidrat dan Serat Dengan Kejadian Diabetes Militus Tipe II di Wilayah Kerja Puskesmas Purwosari.
3. Andi, & Sulilowati. (2008). Faktor Risiko Diabetes Melitus di Rumah Sakit Umum Dr. Wahidin Sudirohusodo Makasar. *Jurnal Ilmiah Nasional*.
4. Bintanah, S., & Erna , H. (2011). Asupan Serat dengan Kadar Gula Darah, Kadar Kolesterol Total dan Status Gizi pada Pasien Ddiabetes Mellitus Tipe 2 di Rumah Sakit Roemani Semarang. *Jurnal Unimus*, 293-295.
5. Bustan, M.N., 2007. Epidemiologi Penyakit Tidak Menular. Cetakan 2 Rineka Cipta, . Jakarta.
6. Derek, M. I., V., J. R., & Kallo, V. (2017, Febuari). Hubungan Tingkat Stres Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe Ii Di Rumah Sakit Pancaran Kasih Gmim Manado. *e-Journal Keperawatan*, 5(1).
7. Dewi, U. P., & Fillah, F. D. (2013, Juni). Hubungan antara Densitas Energi dan Kualitas Diet Dengan Indeks Massa Tubuh (IMT) pada Remaja. *Journal of Nutrition College*, 2(4).
8. Fitri, & Yeti, W. (2012). Asupan Energi, Karbohidrat, Serat, Beban Glikemik, Latihan Jasmani dan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2. *Medika Media Indonesia*, 2(2).
9. IDF, A. (2015). *Diabetes Fakta dan Angka*.
10. Handayani, D. (2016, Juni). Densitas Energi dan Sajian Karbohidrat Makanan Tradisional dan Modern di Kota Malang. (Nurrika Azizah, Ed.) *Indonesian Journal of Human Nutrition*, 3(1), 12-13.
11. Hingle, M. D., Wertheim, C. B., & Neuhouser, L. M. (2017, Mei). Association between Dietary Energy Density and Incident Type 2 Diabetes in the Women's Health Initiative. *the Academy of Nutrition and Dietetics*, 117(5).
12. IDF, A. (2015). *Diabetes Fakta dan Angka*.
13. Izzati, W. & Nirmala. (2015). *Hubungan Tingkat Stres Dengan Peningkatan Kadar Gula Darah Pada Pasien Diabetes Melitus Di Wilayah Kerja Puskesmas Perkotaan Rasimah Ahmad, Bukit Tinggi*. Jurnal Program Studi D III Keperawatan STIKes Yarsi Sumbar Bukittinggi.
14. Lanywati, E. (2007). *Diabetee Mellitus Penyakit Kencing Manis*. Yogyakarta: KANISUS.
15. Meivy, I. D., Julia , V. R., & Vandri, K. (2017, Febuari). Hubungan Tingkat Stres dengan Kadar Gula Darah pada Pasien Sibetes Militus Tipe II di Rumah Sakit Pancaran Kasih Gimim Manado. *Jurnal Keperawatan*, 5, 2-4.
16. Peramesti, T. A., Edi, K. T., & Wardhana, Z. F. (2018). Faktor-Faktor Determinan Depresi Terhadap Kadar Glukosa Darah Puasa Pada Pasien Diabetes Melitus Tipe 2 Di Puskesmas Dawan 1. *Bali Health Journal*.
17. Ramayulis, R. (2014). *Diet Rendah Energi dengan Seimbang Teratur*. (A. Mu'min, Ed.) Jakarta, DKI Jakarta.
18. Riskesdas. (2013). *Laporan Riset Kesehatan Dasar*. Jakarta: Badan Penelitian dan Pengembangan Kesehtan Kementrian Kesehatan RI.

19. Siagian, A. (2010). *Epidemiologi Gizi*. Jakarta: Erlangga.
20. Suciati, D. (2014). Hubungan Antara Kecemasan dengan Kadar Gula Darah pada Pasien Diabetes Melitus di Rumah Sakit DKT. Yogyakarta: Naskah Publikasi.
21. Sudiarti, & Indrawani. (2007). *Bahan Makanan dan Zat Gizi*. Jakarta: Pt Raja Grafindo Persada.
22. Wang, J., Luben, R., Tee, K. K., Bingham, S., J, N. W., & G, N. F. (Eds.). (2008, November). Dietary Energy Density Predicts the Risk of Incident Type 2 Diabetes. *Diabetic Care*, 31(11), 2120–212.
23. Watkins, K. J., & Baldo, T. D. (2010). The infertility experience: biopsychosocial effect and sugestions for counselors. *Journal of Counseling & Development*, 82, 394- 402.
24. WHO, W. H. (2013). *Definition, Diagnosis classification of Diabetes Militus and Tits Complications*. WHO Consultation.
25. Wiardani, N. K. (2007, Juli). Pola Makan dan Obesitas Sebagai Faktor Risiko Diabetes Militus Tipe 2 di Rumah Sakit Sanglah Denpasar. (H. Hady, Ed.) *Jurnal Klinik Indonesia*, 4(1), 5-7.
26. Yuliza, D. (2005). *Pedoman Pemeriksaan Laboratorium untuk Penyakit Diabetes Melitus*. bDepartemen Kesehatan RI; Jakarta.
27. Yunita, C. (2017). Hubungan Densitas Energi Diet, Lemak Viseral, Tingkat Stres, Dan Tekanan Darah Pada Pasien Dewasa Dengan Diagnosa Diabetes Melitus Tipe Ii Di Puskesmas Kecamatan Kebon Jeruk . Jakrta : Universitas Esa Unggul.