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THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND DIET WITH BLOOD SUGAR LEVELS IN TYPE 2 DIABETES MELLITUS PATIENTS DURING THE COVID-19 PANDEMIC

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ABSTRACT

Background: Diabetes is the second most common comorbidity due to the decline in the immune function of diabetics is one of the factors triggering the ease of COVID-19 during this pandemic. Lifestyle changes can trigger an increase in diabetes mellitus namely physical activity and diet. This study aimed to determine the relationship between physical activity and diet with blood sugar levels during Type 2 Diabetes Mellitus during the COVID-19 Pandemic in the Makrayu Health Center Palembang working area in 2021. **Method : T**his study is an observasional analytic with a cross-sectional design. Data was taken by purposive sampling technique with as many as 53 respondents. Data collected using Baecke's questionnaire and diet questionnaire, and data analyzed by Mann-Whitney test. **Results:** The results of this study indicate that 68.8% are female, the average age of the respondents is 59.77 years, and the average length of the suffering of the respondents is 5.28 years. 22.6% of respondents with a history of DM. 52.8% of mild physical activity, 49.1% of respondents with poor diet, average blood sugar when respondents were 250.19 mg/dl. The results of the analysis of physical activity with temporary blood sugar levels (p-value = 0.001) and analysis of eating patterns with temporary blood sugar levels (p-value = 0.0005). **Conclusion:** The results of this study can be input for health workers to provide education about the importance of doing regular physical activity and maintaining a diet to increase physical activity and a good diet for people with type 2 diabetes mellitus.

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INTRODUCTION

COVID-19 can attack almost all ages, elderly groups, and people with a history of chronic diseases (com- morbid) such as hypertension, diabetes mellitus, cardiovascular disease, and chronic lung disease. Diabetes is the second most common comorbidity, with about 8% of cases, after hypertension, with a mortality rate of three times compared to sufferers at 7.3% versus 2.3% (PERKENI, 2020).

The number of COVID-19 cases in Indonesia as of July 13, 2020, was 76,981 people, 36,689 recovered cases, and 3,685 death cases. Of all these confirmations, some patients already have comorbidities or comorbidities. Diabetes mellitus is one of the non-communicable diseases reported by some COVID-19 patients (Ministry of Health, 2020). The severity of COVID-19 is significantly higher in patients with diabetes than in non-diabetics. The decline in immune function of people with diabetes is one factor triggering the ease of COVID-19 during this pandemic. Therefore, people with congenital disease DM can become a severe problem during the COVID-19 pandemic (Roeroe et al., 2021).

Diabetics older than 60, uncontrolled blood sugar levels, and diabetes complications are associated with poor COVID-19 prognosis. Uncontrolled blood sugar predisposes to diabetes to suffer from severe infections. To avoid this, strict glycemic control must always be applied (PERKENI, 2020).

It is highly recommended to have an independent blood glucose checker to check blood glucose at home (PERKENI, 2020). Independent blood glucose checking can be done at any time in patients without fasting, which is measured using venous plasma specimens or capillary blood, criteria form. GDS examination is categorized as DM if it is more than equal to 200 mg / dL. (ADA, 2014). Individuals with diabetes are also advised to consume proper dietary and physical exercise at home. This can improve glycemic control and reduce the risk of infection (PERKENI, 2020).

According to (the Ministry of Health, 2020), it is estimated that there are at least 463 million people aged 20-79 years in the world who have diabetes in 2019, or equivalent to 9.3% of the total population at the same age. Based on gender, the IDF estimates the prevalence of diabetes in 2019 at 9% in women and 9.65% in men. The prevalence of diabetes is estimated to increase with the age of the population to 19.9% or 111.2 million people aged 65-79 years. The figure is predicted to continue to increase until it reaches 578 million by 2030 and 700 million by 200 million by 2030—year 2045.

Type 2 diabetes mellitus is the most common type of diabetes. About 90-95% of diabetics belong to type 2 diabetes mellitus. Usually occurs at 45 years and over, but it can also be found at 20 years (Putri &; Isfandiari, 2013).

There are four pillars of management to maintain blood sugar levels under normal conditions in patients with type 2 Diabetes Mellitus: education with counseling, physical activity, maintaining a healthy diet, and pharmacological interventions (PERKENI, 2015). Changes in community structure from agrarian patterns to industrial societies contribute to many lifestyle changes that can trigger an increase in non-communicable diseases, including diabetes mellitus; some of these lifestyles are diet and physical activity. Diet and physical activity significantly influence the incidence of Type 2 Diabetes Mellitus (Ponzo, 2018). Non-communicable diseases including uncontrolled DM have an impact on the patient's quality of life (Wati et al., 2019).

Therefore, prevention and control efforts are needed so that complications do not occur in patients with DM. Based on this background, this research aims to analyze the relationship between physical activity and diet with blood sugar levels during diabetes mellitus Type 2 during the COVID-19 pandemic in the Makrayu Health Center Working Area.

METHOD

This study is an observational analytical research using a *cross-sectional* design, using sampling techniques, namely *purposive sampling with* independent variables (free) of physical activity and diet and dependent variables (bound), namely blood sugar levels of patients with type 2 diabetes mellitus during the COVID-19 pandemic. The research was

conducted on May – Juni in 2021, in the Working Area of the Makrayu Health Center, Palembang. The sample size calculated is 53.

RESULTS

Table 1. Frequency distribution Based on the Gender of type 2 DM and DM history in the familieat the working area of the Public Health Center in Palembang, 20221

Variables	Frequency	Percentage (%)
Gender	37	69.8
- Male	16	30.2
- Female		
DM History		
- Yes	12	22.6
- No	41	77.4

Based on Table 1 above illustrates the frequency distribution of sex of type 2 DM respondents at the Makrayu Palembang Health Center; it was found that 37 (68.8%) female respondents and male respondents amounted to 16 (30.2%) respondents. It was found that those with DM history in families amounted to 12 (22.6%) respondents and those who did not have DM history in families there were 41 (77.4%) respondents.

Table 2. Distribution of respondents Based on the Age of type 2 DM and Long-suffering at the working area of the Public Health Center in Palembang

Variables	Mean	Median	SD	Min-Max	95 % CI
Age	59,77	61	8,691	36-80	57,40 62,15
Old suffer	5,28	5	3,319	1-20	4,37-6,20
Blood Sugar When	250,19	220	96,118	138-564	223,70-276,68

Based on Table 2 above, it illustrates the age distribution of respondents with type DM 2 at Puskesmas Makrayu Palembang, the analysis results found that the average age of respondents was 59.77 years (95%CI: 57.40-62.15) middle value of 61.00 years, with a standard deviation of 8.691 years. The youngest

Data collected using Baecke's questionnaire and diet questionnaire. Data were analyzed univariately and bivariately using the Mann Whitney test.

is 36 years old, and the oldest is 80 years old. From the results of interval estimation, it can be concluded that 95% believe that the average age of respondents with type 2 DM in the Makrayu Palembang Health Center Working Area is between 57.40 and 62.15 years.

Distribution of long-suffering respondents with Type 2 DM in the Working Area of the Makrayu Palembang Health Center, the results of data analysis found that the average length of suffering was 5.28 years (95%CI: 4.37-6.20) middle value of 5.00 years with a standard deviation of 3.319 years. Long-suffering fastest 1 year and long-suffering longest 20 years. From the results of interval estimation, it can be concluded that 95% believe that the average length of suffering from Type 2 DM is between 4.37 to 6.20.

Describing the distribution of blood sugar levels when respondents with type 2 diabetes in the working area of the Makrayu Palembang Health Center, the results of data analysis found that the average blood sugar when was 250.19 mg/dl (95%CI: 223.70-276.68) median value of 220.00 mg/dl with a standard deviation 96.118. Blood sugar is at its lowest at 138mg/dl and the highest at 564mg/dl. From the results of interval estimation, it can be concluded that 95% is believed that the average blood sugar during Type 2 DM is between 223.70-276.68 mg/dl.

Table 3. Frequency distribution based on the physical activity of respondents with type 2 diabetes in the working area of the Makrayu

Variables	Frequency	Percentage (%)
Physical Activity		
- Light		
- Keep	28	52.8
	25	47.2
Diet	26	49.1
- Not Good	27	50.9
- Good		

Based on Table 3 above illustrates the distribution of the frequency of physical activity in respondents with type 2 DM in the Working Area of the Makrayu Palembang Health Center; those who have light activity amounted to 28 (52.8%) respondents, and who had moderate activity in 25 (47.2%) respondents. The distribution of dietary frequency in respondents

with type 2 DM in the Working Area of the Makrayu Palembang Health Center; 26 (49.1%) respondents had poor diets, and 27 (50.9%) respondents had good diets.

The result of bivariate analysis are presented in Table 4 below:

Table 4. Distribution of blood sugar levels when respondents with type 2 diabetes in the working area of the Makrayu Health Center Palembang in 2021

Physical Activities	n	Mean	SD	p value
- Light	26	296.96	21.3	0.001
- Keep	27	108.697	10.22	
Diet				
- Ligh	26	296.96	108.697	0.0005
- Keep	27	205.15	55.13	

The table above shows the average blood sugar level when respondents with light physical activity are 288.68 mg/dl with a standard deviation of 108.741 mg/dl. at the same time, for respondents who have moderate physical activity, the average blood sugar level at times is 207.08 mg/dl with a standard deviation of 55.230 mg/dl—because of the abnormal distribution of data, continued using the *Mann-Whitney test* results of research analysis of the relationship between physical activity and blood sugar when obtained p-value= 0.001. These results showed a significant difference in blood sugar between respondents with light physical activity and respondents with moderate physical activity (there was a significant relationship between physical activity and blood sugar levels at any time).

The average blood sugar level when respondents In comparison, for respondents who have a good diet, the average blood sugar level at any time is 205.15 mg/dl with a standard deviation of 55.126 mg/dl. Because of the distribution of abnormal data, we continued using the *Mann-Whitney test* results of research analysis of the relationship between diet When blood sugar was obtained, p-*value* = 0.0005 ($p<\alpha$). These results showed a significant difference in blood sugar between respondents with poor eating patterns and respondents with good eating patterns (there was a significant relationship between diet and blood sugar levels at any time).

DISCUSSION

The results of research conducted in the Makrayu Health Center Palembang found to be female amounted to 37 (68.8%) respondents, male sex amounted to 16 (30.2%) respondents. In line with research by Masi & Mulyadi (2017), it was stated that respondents of patients with type II diabetes mellitus with female gender more with a number of 48 (64.0%) than respondents who were male gender with a total of 27 (36.0%). Whereas according to (Yahya, 2018), explained that after age 30, women have a higher risk than men. This is evidenced by the presence of women affected by diabetes during pregnancy. This is because women have an increased insulin resistance component during pregnancy.

In this study, the analysis results found that the average age of respondents was 59.77 years in line with research (Damayanti, 2015) explained that the risk factor for type 2 diabetes mellitus is the age over 30 years, this is due to anatomical, physiological, and biochemical decreases. The Chairman of the *Indonesia Diabetes Association* said that Type 2 Diabetes Mellitus is usually found in adults aged 40 years and over.

In this study, the results of data analysis found that the average length of suffering was 5.28 years. This research aligns with Setiyorini & Wulandari (2017) obtained that most respondents suffered from Type 2 DM for more than 5 years, as many as 59 people.

In this study, 12 (22.6%) respondents had a family history of DM, and 41 (77.4%) respondents had no family history of DM. Supported by research conducted by Holy Yunits Nuraini &; Surpiatna, (2016) The Relationship between Diet, Physical Activity, and Family History of Type 2 Diabetes Mellitus showed that there were 9 people (26.5%) with a family history of the disease and 25 people with no family disease (73.5%). (Yahya. 2018) explained that people with a family history of DM are more likely to suffer from the same disease; the risk depends on the number of family members with diabetes. There is a 5% risk of developing diabetes if parents or siblings also have diabetes. The risk can increase to 50% if you are overweight.

In this study, 28 (52.8%) respondents had light activity, and 25 (47.2%) had moderate activity. This research is in line with research conducted by Amelia et al (2019). Some respondents had light physical activity (53.2%), and respondents who had moderate physical activity (46.8%). Physical activity is beneficial for the use of blood sugar (Riyadi &; Widuri, 2015). During physical activity, the muscles will contract to cause movement. Contraction of muscles results from the breakdown of sugar stored in

muscles which is then converted into energy. The muscles then require energy to move. The use of sugar Stored in the muscles will further affect the decrease in blood sugar levels.

The study found that those with a poor diet comprised 26 (49.1%) respondents and those with a good diet, 27 (50.9%) respondents. This research is in line with research conducted by Amelia, et al (2019) some respondents have a poor diet (34%) and some respondents have a good diet (66%). According to (Yahya, 2018) a poor diet is one of the factors causing diabetes. Foods that contain too much sugar and foods with a high glycemic index. In addition, foods that contain high fat and high cholesterol can also trigger diabetes. This type of food can trigger overweight or obesity.

In this study, blood sugar levels were obtained when respondents with type 2 DM were in the Makrayu Palembang Health Center working area. The results of data analysis found that the average blood sugar when was 250.19 mg/dl. Factors that affect blood sugar levels in diabetics such as food consumed and physical activity carried out, mainly occur due to irregular eating patterns, and lack of physical activity and increased life expectancy (Widana, 2020). Moderate (a significant relationship exists between physical activity and blood sugar levels over time).

This study's results align with previous research conducted by Paramitha &; Mega (2014), where physical activity patterns with blood sugar levels are related because respondents with light activity patterns can increase blood sugar levels. According to (Riyadi &; Widuri, 2015), physical activity is a circadian rhythm in humans. Each individual has a unique rhythm in their daily lives in carrying out their activities, both for work, eating, rest, recreation, and so on.

Physical exercise for Type 2 Diabetes Mellitus is highly recommended in reducing blood sugar levels (Kurniawan, & Wuryaningsih, 2016). According to study in Central Tapanuli, it shows that physical activity can also increase the metabolic base in DM patients (Tarihoran, 2022). Regular physical activity can reduce blood sugar levels in DM patients (Subarja et al., 2022).

Researchers assume that a person with light physical activity can increase blood sugar levels in the body because muscle contraction results from the breakdown of sugar stored in muscles which are then converted into energy. The results of this study are supported by the results of research conducted by Rahamawati (2011) on the relationship between diet and activity with blood glucose levels of outpatient Type-2 Diabetes Mellitus patients at Dr. Wahidin Sudirohusodo Hospital Makassar, from the results of his research, the increase in blood glucose levels in patients with Type-2 DM is higher in respondents who have a poor diet.

According to (Nurrahmani, 2012) this is the theory that says food plays a role in increasing blood sugar levels. In the process of eating, the food eaten will be digested and then converted into a form of sugar called glucose. Researchers assume that someone with a poor diet can increase blood sugar levels in the body due to poor eating frequency, such as not following the 3J correctly, namely, schedule, amount, and type. The food eaten will be digested and then converted into sugar called glucose.

CONCLUSION

Based on the results of the study obtained 68.8% of respondents with Type 2 Diabetes Mellitus were female with an average blood sugar level of 250.19 mg/dl, while the relationship between physical activity and blood sugar levels in patients with Type 2 Diabetes Mellitus during the COVID-19 pandemic and the relationship between diet and blood sugar levels in patients with Type 2 DM.

Therefore, it is necessary to provide information about the importance of physical activity and diet to patients with DM.

CONFLICT OF INTEREST s

The authors declare that they have no Conflict of interests

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