



Stress Levels with Blood Sugar Levels in Type II Diabetes Mellitus Patients in Padang City in 2024

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ABSTRACT: Diabetes mellitus is a chronic disease that often causes stress. Several studies have shown that stress is a factor that triggers blood sugar levels to rise. The purpose of the study was to determine the relationship between stress levels and blood sugar levels in type II DM patients in Padang City in 2024. Research design *cross sectional study*. The research was conducted from January 2024 to June 2024 in Padang City in 2024. The population was all type II DM patients who visited the Puskesmas andalas Padang City, and checked blood sugar levels at the time of the study. The sample size was 41 people with *accidental sampling* technique. Data collection with questionnaires and examination of blood sugar levels. Data analysis with frequency distribution and *Chi-Square* test. The results showed that the blood sugar levels of respondents who were not normal were 51.2% and the stress level of respondents in the moderate category was 41.5%. The results also found a significant relationship between stress levels and blood sugar levels in patients with type II diabetes mellitus with $p\text{-value} = 0.0001$ ($P < 0.05$). Based on the results of the study, there is a tendency to increase blood sugar levels in patients with Type II diabetes mellitus with increased stress. So, the most important thing is to be able to avoid something that can make stress so that the level of blood glucose levels is in good condition in order to try to run a regular diet and prevent various complications of diabetes mellitus and try to do activities that can reduce stress levels such as exercising and doing relaxation. Based on the results of the study, stress management in type II Diabetes Mellitus patients is very necessary for one of them as controlled blood sugar levels in Type II Diabetes Mellitus patients. One of the health center officers, nurses, has an important role in managing stress in type II DM patients.

KEYWORDS: Blood Sugar Level, Stress Level, Type II Diabetes Mellitus

INTRODUCTION

Diabetes mellitus is a chronic metabolic disease resulting from the body not being able to produce enough insulin or not being able to use insulin effectively resulting in an increase in glucose levels in the blood [1]. Diabetes mellitus has two types, one of which is type II diabetes mellitus. People with type II diabetes are said to have insulin resistance [2].

Indonesia is in 5th place with 19.47 million people with type 2 diabetes mellitus out of a population of 179.72 million, which means the prevalence of type 2 diabetes mellitus in Indonesia is 10.6%. In 2021, the number of people with diabetes mellitus is 19.47 million. West Sumatra is in the 20th rank with 20,663 incidents / cases, with the highest number of cases in the Padang City area totaling 12,231 cases [3]. Based on the Padang City Health Office Report 2020, of the 23 Puskesmas in Padang city, the highest prevalence of Diabetes Mellitus cases is in the Andalas health center of 1,017 people. Of the 1,017 people who suffer from Diabetes Mellitus, only 774 people often control their health at the Andalas Health Center in Padang City [4].

Many factors are thought to be the cause of uncontrolled blood sugar levels in patients with type II diabetes mellitus, one of which is stress. When a person is stressed, the body produces too much cortisol. Cortisol is a hormone that counteracts the effects of insulin and causes high blood sugar and decreases the body's sensitivity to insulin [5]. Research (Putra, Oktarina, & Sulistiawan, 2023)[6], about the relationship between "Stress Levels with Blood Sugar Levels in Diabetes Mellitus Patients at Puskesmas Simpang IV Sipin" The results showed that there was a correlation between stress levels and blood sugar levels in Diabetes Mellitus patients with Pearson correlation analysis obtained a $p\text{-value}$ of $0.000 < 0.05$ and $r = 0.650$. There is a relationship between stress levels and blood sugar levels in Diabetes Mellitus patients at the Simpang IV Sipin Health Center, Jambi City.

Research (Desi Aprillia, Mery Tania, 2023)[7] on the relationship between stress levels and blood sugar levels of diabetes mellitus patients in Bandung City found a correlation between stress levels and blood sugar levels in Bandung City.

His research explains that there is a significant relationship between stress levels and blood sugar levels of patients with diabetes mellitus obtained $p\text{ value} = 0.048$, $r = 0.232$ ($\alpha < 0.05$).



Research (Yusuf, 2020)[8], on the relationship between Stress Levels and Blood Sugar Levels in Patients with Diabetes Mellitus at the Kebakkramat 1 Health Center shows that the results of the study show a relationship between stress levels and blood sugar levels in patients with diabetes mellitus at the Kebakkramat 1 Health Center. The analysis results show p value = 0.000. There is a relationship between stress levels and blood sugar levels in patients with diabetes mellitus at the Kebakkramat 1 Health Center, namely the higher the stress of patients with diabetes mellitus, the higher the blood sugar level or abnormal.

Research (Mustaqim, Fatrahady, Pratiwi, & Syuhada, 2023)[9] on the relationship between stress levels and blood glucose levels at the time of Fk Unizar students in 2022 showed that the results of the study there was a significant relationship between stress levels and blood glucose levels at the time of the students of the Faculty of Medicine of Al-Azhar Islamic University. There is a significant relationship between stress levels and blood glucose levels at the time of the students of the Faculty of Medicine of Al-Azhar Islamic University.

RESEARCH METHODS

The research design used was *cross sectional study*. The study was conducted from January 2024 to June 2024. The population was all DM type II patients who visited Puskesmas Andalas Padang City and checked blood sugar levels at the time of research data collection and checked blood sugar levels from February 19 to March 13, 2024. Sample size 41 people with *accidental sampling* technique. Data collection with questionnaires and checking blood sugar levels at the time. Data analysis with frequency distribution and *Chi-Square* test. The inclusion criteria in this study were patients visiting the health center, patients who performed blood sugar checks, cooperative respondents, and willing to become respondents. Meanwhile, the exclusion criteria for this study were respondents who resigned during the research activities and patients who were referred to health agencies.

RESEARCH RESULTS

A. Blood Sugar Levels

The results of the study of blood sugar levels in Type II DM patients visiting the Andalas Padang Health Center can be seen in table 1

Table 1. Frequency Distribution of Respondents Based on Blood Sugar Levels at Puskesmas Andalas Padang City 2024

Blood Sugar Levels	n	%
Normal	20	48.8
Not Normal	21	51.2
Total	41	100

Based on table 1, it can be seen that more than half (51.2%) of Type II DM patients who visit the Andalas Padang Health Center with abnormal blood sugar levels.

B. Stress Level

The results of the study of stress levels in Type II DM patients visiting the Andalas Padang Health Center can be seen in table 2

Table 2. Frequency Distribution of Respondents Based on Stress Level at Puskesmas Andalas Padang City Year 2024

Stress Level	n	%
Mild Stress	13	31.7
Moderate Stress	17	41.5
Severe Stress	11	26.8
Total	41	100

Based on table 2, it can be seen that more respondents experienced moderate stress levels with 17 respondents (41.5%).



C. Relationship between Stress Level and Blood Sugar Level

The results of research on the relationship between stress levels and blood sugar levels in Type II DM patients visiting the Andalas Padang Health Center can be seen in table 3.

Table 3. Frequency Distribution of Respondents Based on Stress Levels and Blood Sugar Levels at Puskesmas Andalas Kota Padang Year 2024

Stress Level	Blood Sugar Levels				Total		P Value
	Normal		Not Normal		n	%	
	n	%	n	%			
Mild stress	12	92.3	1	7.7	13	100	0,0001
Moderate stress	6	35.3	11	64.7	17	100	
Severe Stress	2	18.2	9	81.8	11	100	
Total	20	48.8	21	51.2	41	100	

Based on table 3, it can be seen that abnormal blood sugar levels are more in patients with severe stress levels (81.8%) and moderate (64.7%) than mild stress levels (7.7%). The results of the *Chi Square* statistical test obtained a value of $p = 0.0001$ ($P < 0.05$), meaning that there is a significant relationship between stress levels and blood sugar levels in patients with Type II Diabetes Mellitus at Puskesmas Andalas Padang City.

DISCUSSION

The results of the study found that there is a significant relationship between stress levels and blood sugar levels in patients with Type II Diabetes Mellitus at the Andalas Health Center, Padang City. Based on the percentage there is a tendency that patients with severe stress and moderate stress tend to have abnormal blood sugar levels.

The relationship between stress and blood glucose levels in patients with diabetes mellitus, states that stress is an important influential factor for people with diabetes, an increase in stress hormones produced can cause blood sugar levels to increase. A relaxed condition can restore stress hormone regulation and allow the body to use insulin more effectively. The effect of stress on increasing blood sugar levels is related to the neuroendocrine system, namely through the Hypothalamus-Pituitary-Adrenal pathway [10].

The results of this study are the same as research (Derek et al., 2017)[11] with the title "Relationship between Stress Levels with Blood Sugar Levels in Type II Diabetes Mellitus Patients at Kasih Gmim Manado Hospital" there is a relationship between stress levels and blood sugar levels in type II DM patients at Pancaran Kasih GMIM Manado hospital with a $p =$ value of 0.0001.

The results of the study are also the same as research (Nababan & Kaban, 2020)[12] on "The Relationship between Stress Levels and Increased Blood Sugar Levels in DM Type II Patients at RSU Royal Prima Medan" there is a relationship between stress levels and increased blood sugar levels in DM type II patients at RSU Royal Prima Medan with a $p =$ value of 0.004.

In healthy people, the blood sugar regulation mechanism is generally able to stabilize blood sugar levels at normal levels after the stress has passed. However, in people with diabetes or other metabolic disorders, the body's ability to regulate blood sugar may be impaired, causing blood sugar levels to remain high. In addition, severe stress can also impair sensitivity to insulin, a hormone that regulates the use of glucose by the body's cells. Moderate stress, though not as intense as severe stress, can also affect blood sugar levels. Milder but still significant hormonal reactions may occur, especially if the person has a genetic predisposition or an underlying health condition. In people with diabetes, even mild stress can cause unwanted fluctuations in blood sugar levels. In addition, changes in eating habits and behaviors to cope with stress can also affect blood sugar levels [13].

Stress is a factor that affects the control of blood sugar levels in patients with type 2 diabetes mellitus, and high levels of stress in people with diabetes mellitus and lack of control or control during stress can make it difficult to control blood sugar levels [14].



Stress can affect the increase in blood sugar levels twice as easy to attack people with diabetes mellitus with poor blood sugar levels compared to those who do not have diabetes mellitus, where in a state of stress there will be an increase in *catecholamine hormones, endocrine, glucagon, glucocortiroid, and growth hormone*, causing overproduction of cortisol, cortisol is a hormone that counteracts the effects of insulin and causes blood sugar levels to increase [15].

The level of stress experienced by people with diabetes mellitus is caused by changes in themselves that are physical and psychological. Stress accompanied by other emotional attitudes has an impact on whether or not diabetes treatment management is adhered to by diabetics. The higher the stress, the more emotional problems experienced by people with diabetes mellitus, where this condition is associated with weakening the obedience of diabetics in complying with diabetes mellitus treatment management, so that their blood sugar levels will tend to increase.

According to (Fitriyani, 2019)[16] explains that stress in people with diabetes mellitus, in addition to experiencing a deterioration in physical terms, also experiences a deterioration in emotional terms. The emotional aspects include denial, obsessiveness, anger, and fear, all of which are attitudes that appear negative. Many people are in denial when they find out they have diabetes, and do not want to accept the fact that they have to live life as a diabetic. There are even people with diabetes who take several years to change their lifestyle.

Stress accompanied by other emotional attitudes has an impact on the adherence or non-adherence of diabetes treatment management by diabetics. The higher the stress, the more emotional problems experienced by people with diabetes mellitus, where this condition is associated with weakening the obedience of diabetics in complying with diabetes mellitus treatment management, so that their blood sugar levels will tend to increase. The significant relationship between stress levels and blood sugar levels indicates the need for serious attention in providing nursing care to patients. Nurses need to pay attention to the psychological aspects of diabetes mellitus patients in providing nursing care in addition to providing therapy received by patients and carrying out the 3J diet in DM patients [16].

The researchers suggest that respondents who experience high levels of stress tend to have elevated blood sugar levels when compared to those who experience moderate stress. However, for respondents with moderate stress but high blood sugar levels, this was due to other factors such as lack of dietary control, irregularity in taking medications, and lack of physical activity. Therefore, even though they experienced moderate stress, their blood sugar levels remained elevated. On the other hand, respondents with moderate stress levels but high. Normal blood sugar can manage their diet and take their medication regularly, thus keeping their blood sugar levels stable even in stressful situations.

Mild stress levels with normal blood sugar levels are caused because mild stress may not have a significant impact on a person's blood sugar levels because at low levels of stress, the body's response to stress hormones such as cortisol tends to be controlled. The hormone cortisol affects the production of glucose (blood sugar) in the body. In mild stress, the body is able to regulate the production of this hormone so that blood sugar levels can remain stable. However, there are also patients with mild stress levels with abnormal blood sugar levels. This is because the increase in blood sugar levels is not only caused by stress but is caused by other factors such as diet, obesity, and exercise [17].

The results of the study also found patients with normal blood sugar levels at moderate and severe stress levels. This is due to the patient even though experiencing stress the patient can manage his stress well and is supported by a diet that is in accordance with the DM diet, regular exercise and regular and appropriate treatment. [18].

Moderate stress levels with abnormal blood sugar levels because moderate stress can contribute to abnormally elevated blood sugar levels through several mechanisms. When the body experiences stress, such as work pressure or personal problems, stress hormones such as cortisol are released. Cortisol increases glucose production in the liver (gluconeogenesis) and reduces the ability of insulin to utilize glucose, which can lead to increased blood sugar levels. The "fight-or-flight" response triggered by stress leads to an increase in general metabolism in the body, including the release of glucose from the body's reserves to provide additional energy in the face of stress. Stress often leads to changes in diet and physical activity. Some people may tend to eat more or choose less healthy foods when stressed, which can lead to temporary spikes in blood sugar levels[18].

Severe stress levels with normal blood sugar levels because Severe stress can affect the body in various ways, even though blood sugar levels remain normal. This can occur due to complex hormonal regulation and the body's varied responses to stress. In hormonal regulation, when a person experiences severe stress, such as high emotional distress, the body releases stress hormones such as cortisol and adrenaline. Cortisol, for example, can increase glucose production in the liver (gluconeogenesis) to provide



additional energy when the "fight-or-flight" response is active. Although stress can temporarily raise blood sugar levels, individuals with normal insulin function can usually re-regulate blood sugar levels into the normal range quickly once the stress is relieved. Diet and physical activity can also influence how the body regulates blood sugar, regardless of the stress experienced. People who maintain a balanced diet and exercise regularly may have better blood sugar control despite severe stress[18].

Severe stress levels with abnormal blood sugar levels because severe stress can affect blood sugar levels due to a complex hormonal response in the body. When a person experiences stress, the body releases hormones such as cortisol and epinephrine (adrenaline), which can increase blood sugar levels to provide extra energy in a "fight or flight" situation. If stress lasts for a long period of time or occurs chronically, it can cause problems with blood sugar regulation, especially in individuals who are prone to diabetes or have insulin resistance[17].

Based on the research, those experiencing high stress levels tend to have elevated blood sugar levels when compared to those experiencing moderate stress. However, for respondents with moderate stress levels but high blood sugar levels, this was due to other factors such as lack of control over diet, irregularity in taking medication, and lack of physical activity. Therefore, even though they experienced moderate stress, their blood sugar levels remained elevated. On the other hand, respondents with moderate stress but normal blood sugar levels were able to manage their diet and take their medication regularly, thus keeping their blood sugar levels stable despite the stressful situation.

High blood sugar levels can be closely tied to stress and affect the body, chronic stress can lead to increased production of stress hormones such as cortisol and adrenaline. These hormones can interfere with glucose metabolism and increase resistance to insulin, which is a risk factor for type 2 diabetes. Stress reactions can increase glucose production by the liver (gluconeogenesis), which can lead to increased blood sugar levels. Stress often affects a person's diet, tending to eat more foods high in sugar or simple carbohydrates, which can lead to increased blood sugar levels. Stress can affect motivation to exercise or engage in physical activity, which is important for regulating blood sugar levels. Chronic stress can affect a person's mental health, which can affect the ability to manage diabetes and keep blood sugar levels stable. So it's important to remember that effective stress management can help reduce the risk of diabetes-related complications. Strategies such as meditation, regular exercise, adequate sleep, and social support can help manage stress and maintain healthy blood sugar levels.

CONCLUSION

The results showed that moderate and severe stress levels in type II diabetes mellitus patients at the Andalas Health Center in Padang City in 2024 were very likely to experience an increase in blood sugar levels compared to mild stress levels. Based on the results of the study, stress management is an important intervention so that the blood sugar levels of Type II Diabetes Mellitus patients are controlled. In this case the nurse as one of the health workers at the health center plays an important role in facilitating and motivating Type II Diabetes Mellitus patients to carry out stress management.

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