



The Relationship of Stress Level to Blood Sugar Levels in Diabetic Mellitus Patients at UPTD Puskesmas Terara

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Abstract: Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by elevated blood sugar levels due to insulin deficiency or resistance. Stress is a significant factor that can exacerbate blood glucose dysregulation by increasing cortisol levels, which reduces insulin sensitivity. This study investigates the relationship between stress levels and blood sugar levels in DM patients at UPTD Puskesmas Terara. A cross-sectional design was employed with 60 respondents, and data were collected using a stress level questionnaire and blood glucose laboratory tests. The Spearman Rank correlation analysis revealed a significant relationship between stress levels and blood sugar levels ($p = 0.000$, $\alpha = 0.05$). The majority of respondents (58.3%) experienced severe stress, and 65.0% had high blood sugar levels. Findings suggest that increased stress levels correlate with poor glycemic control in DM patients. Addressing psychological stress through lifestyle modifications and stress management interventions may improve diabetes management outcomes. Future research should explore stress reduction strategies and their impact on long-term glycemic control.

Keywords: Diabetes Mellitus; Stress; Blood Sugar Levels; Cortisol; Glycemic Control

Introduction

Diabetes Mellitus is a chronic condition that occurs due to increased glucose levels in the blood because the body does not produce enough insulin or does not use it effectively. Insulin, a hormone produced by the pancreas, plays a role in regulating blood glucose and metabolism. Insulin deficiency causes hyperglycemia (Medina-Ramirez et al., 2024).

According to WHO, DM is divided into 2 main types, namely DM type 1 (DMT1) and DM type 2 (DMT2). Globally, DMT2 is the most common type of DM, with an incidence rate of 90% in DM cases worldwide. For many years DMT2 was only seen in adults, but now it has begun to occur in children (Boeren & Rubenson, 2022). In people with Diabetes Mellitus, the initial symptoms will often be found called the 3Ps, namely Polyuri (a lot of urine), polydipsy (drinking a lot), and polyphagy (eating a lot). Diabetes mellitus is a hyperglycemic disease characterized by the absolute absence of insulin or a decrease in the relative sensitivity

of cells to insulin (Antar et al., 2023; Tomic et al., 2022). DM disease is a degenerative disease that is generally caused by an unhealthy lifestyle (Muhammad Sudrajad, 2024; Safitri et al., 2021)

Diabetes Mellitus (DM) is affected by a variety of risk factors. According to the American Diabetes Association, these factors include a family history of DM, obesity, lack of physical activity, certain race, BMI history, employment, income, education, and diet (Lorber et al., 2024). In addition, DM can also cause stress due to excessive stress, which has an impact on the physical and emotional. In people with diabetes, stress affects metabolism by depleting essential minerals and vitamins. Prolonged stress can lead to functional disorders as well as psychological problems such as anxiety and depression (Bassi et al., 2020; Cheng et al., 2021; Hu et al., 2024). Stress experienced by patients with diabetes mellitus can result in impaired blood sugar control caused by excessive production of cortisol, a hormone that reduces the body's sensitivity to insulin so that it makes it more difficult for glucose in the body to

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enter cells resulting in increased glucose levels in the blood (Eshete et al., 2023; Nooseisai et al., 2021)

DM is one of the top 10 causes accounting for more than 80% of deaths globally, along with other noncommunicable diseases (NCDs). Based on the ninth edition of the International Diabetes Federation (IDF) Diabetes Atlas, the prevalence of DM and Impaired Glucose Tolerance (IGT) with estimates from 211 countries is estimated that for 2019 and 2045 there will be 463 million people with DM with 90% suffering from type 2 diabetes (Medina-Ramirez et al., 2024). However, based on the Global Report World Health Organization (Lorber et al., 2024), globally there are 8.5% of the 422 million adult population worldwide that is estimated to suffer from DM.

In 2019, Indonesia is the top 7th country in adults aged 20-79 years with the most DM in the world after China, India, the United States, Pakistan, Brazil, and Mexico with 10.7 million sufferers. The prevalence of DM in the age of 20-79 years is estimated at 8.4% for women and 9.1% for men with a population of 221 million men and 203.9 million women (Lorber et al., 2024). According to Riskesdas 2018, DM sufferers in Indonesia are more common in women (1.8%) than men (1.2%) (Arifah et al., 2022; Indrahadi et al., 2021; Milita et al., 2021)

The prevalence of Diabetes Mellitus in Riskesdas in 2018 shows the prevalence of DM in all provinces in Indonesia, the prevalence of DM is the first with the highest prevalence occupied by DKI Jakarta province with a prevalence of 3.4%, while the province of NTB itself ranks 21st with a prevalence of 1.6% (Milita et al., 2021). The Health Office revealed quite surprising data. Non-communicable diseases dominate the top 10 highest diseases in NTB. According to data from the Health Office, (2022) for non-communicable diseases of diabetes mellitus, based on doctors' diagnoses in residents of all ages according to the number of districts/cities in West Nusa Tenggara province, the number of diabetic cases was obtained at 64,544 people, judging from the previous year's data, it can be said that diabetes mellitus cases increased very rapidly. The highest incidence of diabetes mellitus is located in the East Lombok regency area with 14,162 people (Prabasuari et al., 2024; Riskawaty, 2022)

Based on the results of a preliminary study on January 11, 2023 at the Terara Health Center, from the highest number of DM cases in East Lombok, the Terara Health Center occupies the 8th position, data on the number of people registered positive for diabetes mellitus in 2022 at the Terara Health Center reached 445 patients diagnosed with DM. The researcher conducted interviews with 10 respondents who happened to control blood sugar at the Terara Health Center, and from the results of the interviews, it was known that

from 10 respondents, 7 of them said they did not maintain their diet, and did not do enough physical activity, 3 of them also said that they did not maintain their diet too much and experienced stress due to life guidance (Fibrianti et al., 2022; Maha Putra et al., 2023).

In some studies, it has been shown that there is a relationship between stress levels and blood sugar levels in people with diabetes mellitus. According to the results of research by Izzati and Nirmala (2015) at the Rasimah Ahmad Bukittinggi Health Center, showing that 62.5% of diabetic mellitus patients who experienced moderate stress and those who did not experience an increase in blood sugar levels as much as 56.3%, there was a relationship between stress levels and blood sugar levels in people with diabetes mellitus through the chi-square test with a value of $p=0.017$ ($p<0.05$) (Ciarambino et al., 2022; Pikula et al., 2024; Samsu, 2021).

The results of Irfan and Heri's (2015) research at the Peterongan Health Center, Jombang Regency on the relationship between stress levels and blood sugar levels in people with diabetes mellitus also said that 55.6% of respondents experienced severe stress and 48.9% of respondents had poor blood sugar levels, there was a relationship between stress and blood sugar levels through the Spearman Rho test with a value of $p=0.001$ ($p<0.05$). Lifestyle changes are a good prevention to reduce stress that will affect blood glucose levels. The best prevention to do is by always thinking positively, doing regular physical activity, eating nutritious and balanced, and regularly doing relaxation (Arismunandar et al., 2022; Jabarpour et al., 2024; OuYang et al., 2021). Based on this description, the researcher is interested in conducting a study on "The Relationship between Stress Levels and Blood Sugar Levels in Diabetes Mellitus Patients at UPTD Puskesmas Terara".

Method

This study uses a quantitative method with the Spearman Rank correlation approach to analyze the relationship between variables. The research design used is cross-sectional, that is, data collection is carried out at the same time, where dependent and independent variables are observed at the same time (Alsaqr, 2021). Cross-sectional is a research design that measures or observes a condition at a certain point in time, including exposure status and disease status ((Maier et al., 2023). This research will be carried out in August-September 2023 at the Terara Health Center, East Lombok Regency. The data collection technique in this study will use existing components in the form of data collection tools/research instruments to obtain valid data with the aim of being proven. Furthermore, the research

determines the time period, data collection method, implementation of data collection, and ends with an analysis of the research results.

Editing is the process of rechecking the accuracy of the data that has been collected, both during data collection and after the data has been collected. Coding is the process of assigning numerical codes to data that has several categories, which is important for data analysis using computers. Usually, a list of codes and their meanings is recorded in a codebook to make it easier to identify variables. Processing or data entry is carried out by entering data into a master table or computer database, then analyzed in the form of frequency distribution or contingency tables. Data cleaning is the process of correcting code errors, data incompleteness, and identifying lost data or data variations (Jha & Basu, 2025; Schmid et al., 2022)

Data analysis is carried out in each study, both qualitative and quantitative. Most of the research tends to use quantitative analysis with statistical methods because it is able to provide answers to the problems being studied. Data analysis was carried out in two stages. First, univariate analysis that uses frequency distribution techniques through SPSS to describe the characteristics of each variable, such as diet, physical activity, and stress levels. Second, bivariate analysis that uses inferential statistics, namely the chi-square test, to measure the relationship between two variables by comparing the observed values with the expected values to determine the level of linkage in the population.

Result and Discussion

This research was carried out in August to September 2023 at the UPTD Terara Health Center located in Terara Village, Terara District, East Lombok Regency. The boundaries of this village are to the north bordering Sukadana village, South Sebeleah bordering Suradadi Village, east bordering Montong Baan Village, west bordering Kalianyar, Raring and Jenggik Villages. The instrument used in this study is a stress level questionnaire using a sample of 60 respondents. The researcher carried out a stress level assessment on all samples by giving a questionnaire to the respondents after the blood draw was completed to check the blood sugar levels of the respondents in the health center laboratory, then continued by determining the stress level experienced by the respondents. The researcher gave an explanation to the respondents about the purpose of the research and the procedure for filling out the questionnaire sheet. Respondents are asked to sign an Informed Consent sheet. Respondents who agree to be respondents are welcome to answer questions on the questionnaire sheet. After all the questions were

answered by the respondents, the researcher asked the respondents to provide the completed questionnaire to the researcher (Tasya et al., 2024; Zehravi et al., 2021).

The results of the research presented in this chapter are from data collected through stress level questionnaires and blood glucose patient observation sheets using laboratory checks conducted by researchers on 60 respondents. Univariate data consists of patient age, gender, education, and occupation (Aini et al., 2024; Ramasubbu & Devi Rajeswari, 2023). Data processing in this study uses percentage. The results of this study are presented in the form of a table as follows:

Table 1. Distribution of respondent frequency based on age at UPTD Terara Health Center

Age Range	Frequency	Percentage (%)
30 – 40	18	30.0
41 – 50	7	11.7
51 – 60	15	25.0
61 – 70	15	25.0
71 – 80	5	8.3
Sum	60	100

Based on the Table 1, it can be seen that the number of respondents aged 30-40 years is 18 people with a percentage of 30.0%, respondents with the age of 41-50 are 7 people with a percentage of 11.7%, respondents with the age of 51-60 are 15 people with a percentage of 25.0%, as well as respondents with the age of 61-70 as many as 15 people with a percentage of 25.0%, and respondents with the age of 71-80 as many as 5 people with a percentage of 8.3%.

Table 2. Distribution of respondent frequency by gender at UPTD Terara Health Center in 2023

Gender	Frequency	Percentage (%)
Man	30	50.0
Woman	30	50.0
Sum	60	100

Based on Table 2, the distribution of respondents by gender is equal. There are 30 male respondents, representing 50.0% of the total, and 30 female respondents, also making up 50.0%. This balanced proportion ensures that both genders are equally represented in the study, allowing for a fair comparison of findings across male and female participants.

The equal distribution of respondents by gender may contribute to more comprehensive and unbiased research results. It allows for an analysis that reflects the experiences, characteristics, or conditions of both groups without dominance from one gender. This balance can enhance the reliability of the study's conclusions, especially in cases where gender differences may influence the outcomes (Ciarambino et al., 2022).

Table 3. Distribution of respondent frequencies based on Occupation at UPTD Puskesmas in 2023.

Gender	Frequency	Percentage (%)
Civil servants	3	5.0
Teacher	9	15.0
Entrepreneurial	18	30.0
IRT	16	26.7
Farmer	14	23.3
Sum	60	100

Based on Table 3, the distribution of respondents by employment status shows variation across different occupations. There are 3 respondents (5.0%) who work as civil servants, while 9 respondents (15.0%) are teachers. A larger proportion, 18 respondents (30.0%), are entrepreneurs, indicating that business-related occupations constitute the highest percentage among the respondents. Additionally, 16 respondents (26.7%) are categorized as housewives (IRT), reflecting a significant portion of the sample. Meanwhile, 14 respondents (23.3%) work as farmers, demonstrating that agricultural occupations also make up a notable percentage. This distribution highlights the diverse employment backgrounds of the respondents, which may contribute to different perspectives and experiences related to the study (Indrahadi et al., 2021).

Table 4. Distribution of respondent frequencies based on Education at UPTD Terara Health Center in 2023

Gender	Frequency	Percentage (%)
No School	15	25.0
SD	17	28.0
JUNIOR	10	16.7
SMA	4	6.7
S1	14	23.3
Sum	60	100

Based on the table 4, it can be seen that the number of respondents with a hundred education levels is 15 respondents with a percentage of 25.0%, respondents with an elementary education level of 17 people with a percentage of 28.0%, respondents with a junior high school education level of 10 people with a percentage of 16.0%, respondents with a high school education level of 4 people with a percentage of 6.7%, and respondents with S1 education level as many as 14 people with a percentage of 23.3% Putri Listia et al. (2024).

Table 5. Frequency Distribution of Stress Levels in Diabetes Mellitus Patients at UPTD Terara Health Center

Gender	Frequency	Percentage (%)
Light	4	6.7
Keep	13	21.7
Heavy	8	13.3
It's very heavy	35	58.3
Sum	60	100

Based on Table 5, the analysis of 60 DM patients showed varying levels of stress. There were no patients with normal stress levels (0.0%), indicating that all patients experienced some degree of stress. Among them, 4 patients (6.7%) had mild stress, suggesting a relatively low psychological burden. Furthermore, 13 patients (21.7%) experienced moderate stress, which may indicate an increasing impact of their condition on mental well-being. This level of stress could be associated with concerns about disease management, lifestyle changes, and potential complications. Addressing stress at this stage is crucial to prevent it from escalating. In addition, 8 patients (13.3%) were categorized as having severe stress. This suggests a significant psychological burden, which might interfere with their ability to manage diabetes effectively. Severe stress can contribute to poor adherence to treatment regimens and negatively affect overall health outcomes.

The highest proportion of patients, 35 individuals (58.3%), experienced very severe stress. This highlights the substantial emotional and psychological distress faced by the majority of patients. Such high levels of stress could worsen diabetes management and overall quality of life, emphasizing the need for effective psychological support and intervention (Eshete et al., 2023; Nooseisai et al., 2021).

Table 6. Distribution of Blood Sugar Level Frequency in Diabetes Mellitus Patients at UPTD Terara Health Center.

Gender	Frequency	Percentage (%)
Usual	6	10.0
Keep	15	25.0
Tall	39	65.0
Sum	60	100

Based on Table 4.6, the analysis of 60 patients with diabetes mellitus shows variations in blood sugar levels. A total of 6 patients (10.0%) has normal blood sugar levels, indicating effective glucose regulation in a small portion of the sample. Meanwhile, 15 patients (25.0%) have moderate blood sugar levels, suggesting the need for careful monitoring and possible lifestyle adjustments to prevent further increases. Most patients, 39 individuals (65.0%), have high blood sugar levels, highlighting a significant concern in diabetes management.

This high percentage suggests that many patients may struggle with glycemic control, which could lead to complications if not properly addressed. These findings emphasize the importance of continuous monitoring, medication adherence, and lifestyle modifications to achieve better blood sugar regulation (Pikula et al., 2024).

Table 7. Cross-tabulation of Stress Levels to Blood Sugar in Patients with Diabetes Mellitus at UPTD Puskesmas Terara.

Stress Levels	Usual		Gender		Total
	F(%)	Keep F(%)	Tall F(%)	F(%)	F(%)
Light	1 (1.7)	2 (3.3)	1 (1.75)	4 (6.7)	4 (6.7)
Keep	2 (3.3)	7 (11.7)	4 (6.7)	13 (21.7)	13 (21.7)
Heavy	0 (.0)	3 (5.0)	5 (8.3)	5 (13.3)	5 (13.3)
It's very heavy	3 (5.0)	3 (5.0)	29 (48.3)	35 (58.3)	35 (58.3)
Total	6 (10.0)	15 (25.0)	39 (65.0)	60 (100)	60 (100)
P value = 0.000					$\alpha = 0.05$

Based on table 7, it can be seen that a small number of respondents (6.7%) who experienced moderate stress levels had a normal blood sugar level of 1 patient (1.7%), moderate blood sugar levels of 2 patients (3.3%), and high blood sugar levels of 1 patient (1.7%). Meanwhile, more than half (58.3%) who experienced severe stress had normal blood sugar levels of 3 patients (5.0%), moderate blood sugar levels of 3 patients also (5.0%), and high blood sugar levels of 39 patients (65.0%). Based on the Spearman rank test, a p-value of $0.000 < \alpha = 0.05$ was obtained. This means that H_a is accepted and H_0 is rejected, which means that there is a significant relationship between stress level and blood sugar levels in patients with diabetes mellitus at UPTD Terara Health Center.

Based on the results of a study at the UPTD Terara Health Center, the frequency distribution of stress levels showed that of the 60 patients sampled, half had a very severe stress level. According to researchers, stress that occurs in diabetic mellitus patients is due to various kinds of guidance that must be passed, such as busy work and various personal problems. Stress conditions occur due to an imbalance between the pressure that the individual faces and the ability to cope with that pressure. Individuals need enough energy to deal with stressful situations so as not to interfere with their well-being (An et al., 2023). The factors that cause stress are internal and external factors. Internal factors occur from behavior, physical conditions, conflicts, and emotions. While external factors consist of the environment, family and economy (Tuttolomondo et al., 2021). This researcher is in line with the research conducted (Bassi et al., 2020; Jabarpour et al., 2024; Tasya et al., 2024) with the title The Relationship between Stress Levels and Blood Glucose Levels in Semester 6 Students of the D3 TLM Study Program at ITS Kes ICM Jombang with a sample of 26 students showing that almost half of them experienced severe stress levels.

The results of the study in table 6 show that out of 60 diabetic mellitus patients, more than half have high blood sugar levels. According to researchers, this happens because most patients are already in pre-elderly age and will enter the elderly age so that they

have a poor body system where the pre-elderly period is a period of susceptibility to various diseases related to lifestyle, one of which is type 2 diabetes mellitus, the older the age, the lower the body function also decreases, including the action of the hormone insulin so that it cannot work optimally and causes high blood sugar levels. This study is in line with a study (Ikhwan et al., 2018) with the title of the relationship between blood sugar levels and stress levels in patients with type 2 diabetes mellitus which was conducted on a research sample of 32 respondents showing that the majority of respondents had bad blood sugar levels (Maha Putra et al., 2023; Prabasuari et al., 2024).

Based on Table 7, from 60 patients with the Spearman rank correlation test, the p value was 0.000 or >0.05 , then H_a was accepted, which means that there is a significant relationship between stress levels and blood sugar levels in patients with diabetes mellitus at UPTD Puskesmas Terara. This research is in line with the theory (Jayadipraja et al., 2025) which states that stress can increase the amount of blood sugar because stress stimulates the endocrine organs to secrete epinephrine which plays a role in converting glycogen (glucose stored in muscle cells and liver) into glucose. This research is also in line with a study (Irman & Saridewi, 2024) with the title The relationship between stress levels and blood sugar levels in students of past learning recognition (RPL) majoring in nursing Batch II at the Palangka Raya Ministry of Health Polytechnic which stated that there was a close relationship between stress and blood glucose levels. However, this study contradicts the study (Putri Listia et al., 2024.; Tasya et al., 2024; Zehravi et al., 2021) with the title of an overview of fasting blood glucose levels at student stress levels which causes that there is no relationship between stress levels and blood glucose levels.

According to researchers, stress is able to raise blood sugar levels because stress can stimulate the endocrine organs to secrete epinephrine which has a very strong effect in causing the process of glycogenesis in the liver so that it will release a large amount of glucose in the blood in a few minutes. Stress conditions that continue for a long time make the role of

the pancreas unable to control insulin production as a hormone that controls virgin sugar. The failure of the pancreas to produce insulin in time causes a series of metabolic diseases such as diabetes mellitus. When combined with a poor lifestyle, lack of exercise, and diabetes risk factors, it is not impossible that diseases identified with urban diseases will occur. Sugar is indeed the cause of diabetes, but stress can trigger diabetes mellitus faster. Sugar consumption is not eliminated, but reduced. Avoid things that can cause stress (Andika, 2018).

Conclusion

The stress level in diabetic mellitus patients at UPTD Puskesmas Terara is more than half in the category of very severe stress. Blood sugar levels in diabetic mellitus patients at UPTD Terara Health Center are mostly in the high category. There is a significant relationship between stress levels and blood sugar levels in patients with diabetes mellitus at the Terara Health Center.

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Conflicts of Interest

The author declares no conflict of interest

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