RELATIONSHIP BETWEEN STRESS LEVEL AND INCREASED BLOOD SUGAR LEVELS IN PATIENTS WITH DIABETES MELLITUS

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Abstract

The prevalence of diabetes mellitus is also rising. Diabetes Mellitus is a chronic disease that necessitates a lengthy recovery period and expensive treatment. People with diabetes mellitus may be more susceptible to stress because they must alter their lifestyles to keep their blood sugar levels controlled. Diabetes Mellitus and stress are closely related conditions, particularly among metropolitan dwellers. Stress might make it difficult for persons with diabetes mellitus to control their blood sugar levels. The goal of the study was to ascertain how stress levels and blood sugar levels in those with diabetes mellitus relate to one another. Utilizing a simple random selection procedure, a sample of 45 respondents with diabetes mellitus from the RW 7 Simokerto Village, Simkerto District, Surabaya, were selected for this study using an observational analytical method using a cross sectional approach. a questionnaire for measuring stress levels. Blood sugar levels were measured using a glucometer through random observations. Data were analyzed using Spearman Rho correlation test. Spearman rank correlation test results obtained p = 0.00 and r = 0.909. This demonstrates a very strong positive association between stress levels and blood sugar levels and suggests that there is a relationship between stress levels and blood sugar levels in patients with diabetes mellitus (H0 refused, H1 approved). Blood sugar levels in the normal range (80-140 mg/dL) were present in the vast majority of responders with stress levels in the non-stress group (score 0–3). The importance of blood sugar levels increases with increasing degrees of stress. Researchers should look into additional variables that may alter blood sugar levels and analyze stress behavior to ensure the findings are more reliable.

Keywords: Diabetes Mellitus; Stress Levels; Blood Sugar Levels

1. Introduction

One of the national issues that needs more attention is diabetes mellitus (DM) with significant implications. Diabetes mellitus (DM) is a chronic condition that demands a lengthy recovery period and high treatment costs. Additionally, the prevalence of DM is rising (Subiyanto, 2019). People with diabetes mellitus may be more prone to stress because they must alter their lifestyle in order to maintain a healthy level of blood sugar in the body. Stress is brought on when a person perceives a mismatch between their available resources and the demands of the situation at hand. Stress develops when expectations are perceived as being excessive and distinct from the preceding condition (Bistara et al, 2020).

According to data from Indonesia's Basic Health Research (Riskesdas), there are 10.9 million diabetics and 17.9 million persons who are at risk of developing the condition. With a prevalence of 6.8, East Java Province is eighth in Indonesia for the number of people who have diabetes. With a prevalence of 6.6, DKI Jakarta, which is in tenth place, is one level below this value. North Maluku, on the other hand, is in the lead with a frequency of 11.1 percent. In contrast, Surabaya has a higher prevalence than East Java, which is seven (Riskesdas, 2014). Numerous variables, such as heredity/genetic factors, obesity, lifestyle changes, a poor diet, medications that impact blood sugar levels, a lack of physical activity, the aging process, pregnancy, smoking, and stress, might contribute to the rising number of

persons with diabetes (Bistara, et al, 2020). If blood sugar levels in Diabetes Mellitus patients are continuously high and uncontrolled, over time there will be complications (complications) which basically occur in all blood vessels, for example: cerebral blood vessels (stroke), eye blood vessels (blindness can occur), blood vessels kidney blood (Chronic Kidney Failure) and others. If there are complications, efforts to heal the situation towards normal are very difficult. Therefore, early prevention efforts for these complications are needed and are expected to be very useful to avoid the occurrence of various unfavorable things (Rahmawati & Hargono, 2022).

Diabetes Mellitus and stress are closely related conditions, particularly among metropolitan dwellers. Stress is brought on by a person's condition deteriorating as a result of life's stresses, an unhealthy lifestyle, rapidly advancing technology, and numerous ailments that are being experienced (Bistara, et al, 2020). According to the study, stress can interfere with a person's ability to maintain their blood sugar levels if they have diabetes mellitus. Growth hormones, glucagon, glucocorticoids, and catecholamine hormones will all be excreted in greater amounts when under stress (Bistara, et al, 2020).

Patients with Diabetes Mellitus started to experience its psychological effects after the illness had been present for a while. Patients start to encounter psychological illnesses, such as stress from their own treatment-related stress (Bistara, et al, 2020). One of the elements that now appears in those with diabetes mellitus is stress. Stress is a universal occurrence that happens in everyday life and cannot be avoided; everyone experiences it. Stress is a non-specific response of the body to any disturbed body demands. Stress can affect a person's entire being, including their physical, psychological, intellectual, social, and spiritual well-being. It can also jeopardize their physiological equilibrium. Negative or destructive feelings toward oneself or others can result from emotional stress. Social stress will affect a person's connections with other people, whereas intellectual stress will affect one's perception and problem-solving skills (Lazarus, 2012).

According to Hawari and Nailufar that stress has become one of the factors that arise in people with Diabetes Mellitus. Stress is very influential on Diabetes Mellitus because it will affect the control and level of blood sugar levels. Situations that cause stress, the stress response can be an increase in the hormone adrenaline which can eventually convert glycogen reserves in the liver into sugar. Continuously high blood sugar levels can cause complications of Diabetes Mellitus (Lazarus, 2012)

Research shows that stress contributes 50 to 70 percent to the onset of most diseases such as cardiovascular disease, hypertension, cancer, skin diseases, infections, metabolic and hormonal diseases, and so on. When a person experiences severe stress, they will show signs of fatigue, headaches, loss of appetite, forgetfulness, confusion, nervousness, loss of sexual desire, digestive disorders and high blood pressure (Lazarus, 2012).

Stress is a confusing term because there are so many different opinions. In a general sense, stress is a general pattern of reactions and adaptations, in the sense of a pattern of reactions to stressors, which can come from within or outside the individual concerned, the ability to deal with *(coping skills)* and the nature of the stressor it faces (Cameron and Meichenbaum). According to Kaplan and Sadock in terms of dynamics, it is a function and ego. They also emphasize the existence of personal resources and defense mechanisms as a special characteristic of the individual. When the ego is functioning properly then everything is in balance. If the stressors faced can be handled adequately, stress will not arise. Not always someone who has the ability to cope successfully with overcoming stressors. After the stressor can be overcome, the individual will tend to return to the original balance (Carolin, 2010).

But it should be emphasized here, stress does not always make people crazy so they have to be in a mental hospital. Because stress has several levels. So as long as the individual is still experiencing mild stress, the individual will only think about it often and try to solve the problem that causes stress. It is impossible for living people to avoid stress for that we must be able to respond and manage stress well so that our quality of life becomes better (Carolin, 2010).

Therefore, researchers are interested in conducting a study entitled "The relationship between stress levels and blood sugar levels in people with Diabetes Mellitus."

2. **Method**

The design used in this study is correlational (relationship/association) with a *cross sectional*. The research was conducted from 19 to 31 March 2022 in RW 7 Simokerto Village, Simokerto District, Surabaya. The population in this study were all DM patients who routinely control approximately once a month at the puskesmas and routinely take medication in Simokerto District, Simokerto Village, Surabaya with a sample of 45 people using the formula for calculating sample size. The sampling technique used in this study is *Simple Random Sampling*. When all of the respondents had been gathered, each respondent's name was written on a piece of

paper and taken at random. Each randomization only took one name, and it was repeated until the required number of samples had been obtained. The analysis used is Spearman Rho correlation statistical test.

Research subjects have obligations in terms of their professional, legal, and ethical conduct. STIKES Adi Husada conducted an ethical test for this study and assigned it an ethics number 155A/PPM/Etik/STIKES-AH/III/2022. Prior to conducting the research, the researcher informed the respondents of additional ethical guidelines. To explain the research, the researcher got in touch with the responder. The explanations cover the following topics: study goals, research methods, advantages of the research, dangers and potential annoyances, protecting data confidentiality, compensation for unforeseen events, and the researcher's accountability. After then, the researcher requested consent to participate in the study. Researchers gathered primary data and requested informed consent from participants. The easy touch blood sugar level assessment tool is the instrument used to measure the dependent variable (blood sugar level), and the Post Traumatic Stress Disorder (PTSD) questionnaire is the instrument used to measure the independent variable (stress level). Civilian Version of the Checklist (PCL-C). After all data has been confirmed for completeness, then the data will be processed and analyzed according to the research objectives.

3. Results
Characteristics of Respondents Based on Gender

Based on Table 1, it shows that most of the respondents in the RW 7 area, Simokerto Sub-district, Simokerto District, Surabaya, are 29 (65%).

Characteristics of Respondents Based on Age

Based on Table 2 shows almost the majority of respondents in the area of RW 7 Simokerto Sub-district Simokerto Surabaya aged > 50 years totaling 22 (49%).

Characteristics of Respondents Based on Recent Education

Based on Table 3, it shows that most of the respondents in the RW 7 area, Simokerto Sub-district, Simokerto Sub-district, Surabaya, had 21 (47%).

Characteristics of Respondents Based on Occupation

Based on Table 4 shows that almost most of the respondents in the RW 7 area, Simokerto Sub-district, Simokerto Sub-district, Surabaya, have private jobs as many as 21 (47%).

Table 1. Gender Distribution in RW 7 Simokerto Sub-District Simokerto District Surabaya on 19-31 March 2022

No	Gender	Total	Percentage
1	Male – Male	16	35%
2	Female	29	65%

Table 2. Sex Age Distribution in RW 7 Simokerto Subdistrict Simokerto Subdistrict Surabaya on 19 – 31 March 2022

No	Age	Total	Percentage
1	18 - 30 Years	4	8%
2	30 - 50 Years	19	43%
3	>50 Years	22	49%
	Total	45	100%

Table 3. Distribution of Recent Education in RW 7 Simokerto Subdistrict, Simokerto Subdistrict, Surabaya on 19 – 31 March 2022

No	Education	Total	Percentage
1	Elementary School	12	27%
2	Junior High School	7	15%
3	Senior High School	21	47%
4	Bachelor Degree	5	11%
	Total	45	100%

Table 4. Distribution of Work in RW 7 Simokerto Subdistrict, Simokerto District, Surabaya on 19 – 31 March 2022

No	Occupation	Total	Percentage
1	Civil Servant	10	22%
2	Private	21	47%
3	Self Employed	6	13%
4	Not Working	8	18%
	Total	45	100%

Characteristics of Respondents Based on Length of Suffering from Diabetes Mellitus

Table 5. Distribution of Length of Suffering in RW 7 Simokerto Village Simokerto District Surabaya on 19 – 31 March 2022

No	Length of Suffering	Total	Percentage
1	<1 Year	9	20%
2	1 - 5 Years	24	53%
3	> 5 Years	12	27%
	Total	45	100%

Based on Table 5 shows most of the respondents in the area of RW 7 Simokerto Sub-district Simokerto Surabaya have suffered from Diabetes Mellitus for about 1 – 5 years totaling 24 (53%).

Distribution of Respondents Frequency Based on Blood Sugar Levels

Table 6. Distribution of Blood Sugar Levels in Diabetes Mellitus Patients in RW 7 Simokerto Village Simokerto District Surabaya on 19 - 31 March 2022

No	Sugar Level	Total	Percentage
1	Hypoglycemia	3	7%
2	Normal	19	42%
3	Hyperglycemia	23	51%
	Total	45	100%

Based on Table 6 shows that the frequency distribution of respondents based on the variable blood sugar levels in the RW 7 Simokerto Village, Simokerto District, Surabaya, most of the respondents scored blood sugar levels in the hyperglycemia category with a total of 23 respondents (51%).

Frequency Distribution of Respondents Based on Stress Levels

Table 7. Distribution of Stress Levels in Diabetes Mellitus Patients in RW 7 Simokerto Village Simokerto District Surabaya on 19 – 31 March 2022

No	Stress Level	Total	Percentage
1	No Stress	22	49%
2	Mild Stress	9	20%
3	Moderate Stress	11	25%
4	Severe Stress	3	6%
	Total	45	100%

Based on Table 7 shows that the frequency distribution of respondents is based on the stress level variable in the RW 7 Simokerto Village, Simokerto District Surabaya, some of the respondents have stress levels in the non-stress category with a total of 22 respondents (49%).

Relationship between Stress Level Variable Data and Blood Sugar Level Variable Data in
Based on Table 7 Spearman test results show a significance level of $p < 0.05$ so that H0 is rejected, that is, there is a relationship There is a very strong correlation between stress levels and blood sugar levels in people with Diabetes Mellitus (DM) with the Correlation Coefffient r=0.909.

Table 8. Relationship between Stress Levels and Blood Sugar Levels in Diabetes Mellitus Patients in RW 7 Simokerto Village, Simokerto District Surabaya

Stress Level	Sugar Levels						Total
	Hypoglycemia	%	Normal	%	Hyperglycemia	%	
Not Stressed	3	7%	19	42%	0	0%	22 (49%)
Mild Stress	0	0%	0	0%	9	20%	9 (20%)
Moderate Stress	0	0%	0	0%	11	24%	11 (24%)
Severe Stress	0	0%	0	0%	3	7%	3 (7%)
Total							45 (100%)

Spearmen test results p = 0.00
Correlation Coefficient r = 0.909

DISCUSSION
1. Identification of Stress Levels

The results of research conducted in RW 7 Simokerto Subdistrict, Simokerto District, Surabaya on 19 - 31 March 2022 regarding stress levels showed that most of them had stress levels with no stress levels (49%), moderate stress levels (25%), mild stress (20%), and severe stress (6%)

When someone is under pressure, they experience stress. Pressure or demands may be in the form of maintaining relationships, fulfilling family obligations, or achieving academic success (Rasmun, 2010). Stress is a personal condition that is impacted by the outside world. Stress problems arise from an imbalance between the demands people experience and their capacity to handle them (Carolin, 2010).

Stressors are variables that can be identified as the cause of stress, the arrival of stressors can be alone or can also be combined, one of which is chemical stressors that arise from outside the body in the form of drugs and medication. According to Lazarus (2012), high or low stress obtained by individuals can be influenced by the individual's own reactions, such as developmental factors. Age and stage of development affect the impact of stress experienced by each individual.

The results of the study showed that almost most of the respondents had a stress level in the non-stress category. Patients with diabetes mellitus

who were studied based on the length of suffering from diabetes mellitus were around 1-5 years in the number of 24 (53%), because they were accustomed to the way therapy was administered, people who had diabetes mellitus for a longer period of time had less stress than those who had recently been diagnosed. Based on the age of the respondents, it was found that at most >50 years, a total of 22 people (49%). A person prefers to work harder between the ages of 30 and 50, which is considered to be an advanced adult age, to reduce the likelihood of experiencing high levels of stress, but after the age of 50, a person simply adjusts to what has been acquired in old age. Based on the education level of the respondents, it was found that the most recent high school education was 21 people (47%). People with higher degrees of education acquire more knowledge, which makes them better equipped than those with lesser levels of education to manage internal stress. Stress might be brought on by a lack of information about how to handle issues at work.

Age, last schooling, and a history of diabetes mellitus can all encourage higher levels of stress. However, how each person handles the stress that develops in his body can also have an impact on the level of stress. The ability to effectively use (human) resources to deal with mental and emotional disturbances or disorders that result from reactions, such as identifying behaviors or situations that lead to stress, changing those behaviors to deal with unhealthy stress, interacting with others, giving yourself time to unwind, and maintaining a healthy lifestyle (Kautzaky, et al, 2016).

2. Identification of Blood Sugar Levels The

Results of research conducted in RW 7 Simokerto Subdistrict, Simokerto District, Surabaya on 19-31 March 2022 regarding blood sugar levels showed that most of them had a sugar level value in the Hyperglycemia category (51%), with the Normal category (42%), and Hypoglycemia category (7%).

Diabetes Mellitus (DM) belongs to a group of metabolic diseases characterized by high levels of glucose in the blood (hyperglycemia) due to defects in insulin secretion, insulin action defects or a combination of both. DM is a disorder of carbohydrate, protein and fat metabolism resulting from an imbalance between insulin availability and insulin requirements. These disorders can be in the form of absolute insulin deficiency, impaired insulin secretion by pancreatic beta cells, inadequate or damaged insulin receptors, inactive insulin production and insulin damage before work (Subiyanto, 2019)

It takes two hours to return to normal. After fasting the previous night, normal morning blood glucose levels range from 70 to 110 mg/dL. 2 hours after consuming food or drinking liquids containing glucose or other carbohydrates, blood glucose levels are typically less than 120–140 mg/dL. Normal blood sugar levels often increase gradually and slightly after the age of 50, especially in those who are not physically moving. Blood glucose levels that are elevated after eating or drinking cause the pancreas to release insulin, preventing additional blood glucose increases and causing blood glucose levels to steadily decline (Susanti & Bistara, 2018).

From the results of the study, it can be seen that most of the respondents experienced hyperglycemia (51%). DM patients studied based on the age level were mostly above 50 years and above with increasing age, the ability of tissue cells to take blood glucose decreased. Based on gender, DM patients were more common in women as many as 29 people (65%) this was due to an unhealthy lifestyle pattern by consuming sweet foods without being balanced with regular exercise, causing an increase in blood sugar levels in women than men (Kautzaky , et al, 2016).

3. Identification of the Relationship between Stress Levels and Blood Sugar Levels The

results of the study based on statistical tests of the relationship between stress levels and blood sugar levels in people with diabetes mellitus in RW 7 Simokerto Subdistrict, Simokerto District, Surabaya on 19-31 March 2022 showed that the level of stress was not characterized by blood sugar levels. hypoglycemia, namely 3 people (7%), non-stress level with normal blood sugar characteristics, namely 19 people (42%), mild stress level with characteristics of hyperglycemic blood sugar level, namely 9 people (20%), moderate stress level with sugar level characteristics hyperglycemic blood, namely 11 people (42%), the level of severe stress with the characteristics of hyperglycemic blood sugar levels is 3 people (7%).

The results of statistical tests concluded that there was a relationship between stress levels and blood sugar levels in patients with diabetes mellitus where p <0.05, namely H1 was accepted, the association had a very strong strength based on the value, indicating that there was a considerable relationship between stress levels and blood sugar levels of r = 0.909 .

Stress is any situation in which non-specific demands require the individual to respond or take action. Stress arises when there is a mismatch between the demands faced and the abilities possessed (Selye, in (Perry, 2006). Diabetics who experience stress can change their diet, exercise, use of drugs that diabetes usually obeys and this causes hyperglycemia (Lazarus, 2012).

The results of this study found that there is a very strong relationship between stress levels and

blood sugar levels, if the stress level shows in the category of severe stress, there will be instability in blood sugar levels. Therefore, it is important to manage stress in people with diabetes mellitus in controlling blood sugar levels so that blood sugar levels remain under control.

Based on the results obtained that 9 respondents experienced mild stress included in the category of hyperglycemia. This is because the researchers used the diagnostic criteria for disorders of blood sugar levels according to[13], which stated that normal blood sugar levels had a value of 80-140 mg/dL. Meanwhile, 6 of them had blood sugar levels of less than 200 mg/dL.

CONCLUSIONS AND SUGGESTIONS

Conclusion
People with diabetes mellitus have a very strong correlation between stress levels and blood sugar levels.

Suggestions
Respondents are advised to lead healthy lifestyles in order to manage stress effectively and keep stable blood sugar levels. Examples of this include recognizing stressful behaviors or situations and modifying them, coping with unhealthful stress, interacting with others, and scheduling downtime.

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