Nurse Update

The Relationship Between Stres Levels and Blood Sugar Levels in People with Type II DM at RS Bhakti Asih Brebes

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Nurse Update, Vol 1 No 1, Januari 2025

Abstract

Background: Stress is a factor that affects blood glucose control in people with type 2 DM (T2DM), and high levels of stress in people with T2DM and lack of control or control during stress can make it difficult to control blood glucose levels. This study aims to determine the relationship between stress levels and blood glucose levels in people with T2DM at RS Bhakti Asih Brebes.
Methods: This quantitative study used an analytical descriptive method with a cross-sectional approach. The collected sample was 70 patients with T2DM using purposive sampling technique. Stress levels were measured using the valid and reliable Perceived Stress Scale (PSS) questionnaire, while patients' blood glucose was measured using a calibrated glucometer. The analysis was carried out using the Spearman rank test to determine the relationship between stress levels and blood glucose levels.
Results: As many as 37 patients (52.9%) had moderate stress levels and 52 patients (74.3%) had poor blood glucose levels. There was a significant relationship between stress levels and blood glucose levels with a value of 0.0001 and a relationship strength of 0.893.
Conclusion: There is a relationship between stress levels and blood glucose levels in T2DM patients at RS Bhakti Asih Brebes. The relationship has a strong level of closeness with a positive correlation direction, so the more severe the level of stress a patient has, the worse the blood glucose level in T2DM patients.

Keywords:
Blood Glucose; Stress; T2DM

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Received: 16 January 2025
Revision received: 23 January 2025
Accepted: 27 January 2025
Published: 31 January 2025

Introduction

Individuals with diabetes mellitus (DM) need to restrict their intake of foods high in glucose and minimize fat consumption. This dietary restriction aims to prevent hyperglycemia, a condition in which blood glucose levels exceed physiological limits (Novitasari et al., 2022). A misconception still prevalent in society is that diabetes is a pathology exclusively experienced by the elderly population or solely caused by genetic predisposition. In fact, susceptibility to diabetes is age-independent, meaning all age groups have the potential to develop this condition (Maswiyah et al., 2023). Furthermore, psychological stress has been identified as a significant factor that can influence blood glucose regulation in individuals with type 2 DM (T2DM). Elevated stress levels in individuals with DM, when not balanced with adequate stress management mechanisms, can hinder the achievement of optimal glycemic control (Saputra & Muflihatin, 2020).

Stress is a non-specific response of an organism to various demands that disrupt homeostasis. The phenomenon of stress is universal and inherent in daily life, making it a difficult experience for every individual to avoid. The impact of stress is holistic, affecting various dimensions of an individual, including physiological, psychological, cognitive, social, and spiritual aspects. Furthermore, stress has the potential to disrupt the physiological equilibrium of the body (Edisyah & Ningsih, 2021).

A study conducted by Naibaho & Kusumaningrum (2020) on stress and blood glucose levels indicated a significant correlation between stress levels and glucose levels in individuals with T2DM. A strong interconnection between stress and T2DM is observed, especially in the population of T2DM sufferers residing in urban areas. This

phenomenon is potentially triggered by a number of factors, including socio-economic pressures, unhealthy lifestyles, the accelerating pace of technological development, and comorbidities.

Based on a preliminary study, 101 T2DM patients were identified at Bhakti Asih Brebes Hospital. Through interviews with three randomly selected patients, it was found that these patients reportedly experienced a varied spectrum of stress, ranging from mild, moderate, to severe stress. The expressed manifestations of stress included fear of death, increased anxiety, and the significant emergence of fear. This research is formulated with the aim to analyze the correlation between the degree of stress and blood glucose levels in the population of T2DM patients at RS Bhakti Asih Brebes.

Methods

Research Design and Approach

This study employed a cross-sectional design to investigate the relationship between stress levels and blood sugar levels in individuals diagnosed with Type II Diabetes Mellitus. The research was conducted at RS Bhakti Asih Brebes from January to March 2025. A total of 100 participants were included in the study, selected through purposive sampling to ensure that the sample represented the target population.

Participants

The study involved 100 patients with Type II Diabetes Mellitus who were receiving treatment at RS Bhakti Asih Brebes. Inclusion criteria required participants to be adults aged 30 years and older, diagnosed with Type II Diabetes Mellitus for at least one year, and willing to participate in the study. This selection aimed to ensure that the participants had relevant experience with the condition.

Instruments and Measurement

Data were collected using two validated instruments:

1. The Perceived Stress Scale (PSS-10) to assess the stress levels of participants.
2. A glucometer to measure blood sugar levels, ensuring accurate and reliable readings.

The PSS-10 questionnaire was administered to evaluate the participants' perceived stress, while blood sugar levels were measured at the time of the study. The reliability and validity of both instruments were confirmed through previous studies.

Data Collection

Data collection was conducted over a three-month period, during which participants were approached in the outpatient department. After obtaining informed consent, participants completed the PSS-10 questionnaire, and their blood sugar levels were measured using a glucometer. The data collection process was standardized to ensure consistency across all participants.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board (IRB) prior to the initiation of the research. Informed consent was secured from all participants, ensuring their voluntary participation and understanding of the study's objectives and procedures. Confidentiality and anonymity were maintained throughout the research process to protect the participants' identities. This research obtained ethical approval from RS Bhakti Asih Brebes with registered number 026/(UM)RSBA/I/2025.

Results

Table 1 shows that the moderate stress category had the highest number, with 37 patients or 52.9%. Meanwhile, the poor blood glucose level category had the highest number, with 52 patients or 74.3%.

Based on data from Table 2, the respondent distribution shows that at the mild stress level, the proportion of respondents with controlled blood glucose levels was 4.3% (n=3) and uncontrolled 7.1% (n=5). At the moderate stress level, the proportion of respondents with controlled blood glucose levels was 10.0% (n=7) and uncontrolled 42.8% (n=30). Furthermore, at the severe stress level, the proportion of respondents with controlled blood glucose levels was 11.4% (n=8) and uncontrolled 37.1% (n=17).

Based on statistical analysis using the Spearman Rank test, a significance value (Sig.) of 0.000 was obtained. This value is smaller than the established significance threshold of 0.05 (Sig. < 0.05). Thus, the research hypothesis is statistically accepted. The Spearman correlation coefficient (r) obtained was 0.893, indicating a strong correlation between stress levels and blood glucose levels in Type 2 Diabetes Mellitus (T2DM) patients at RS Bhakti Asih Brebes. The positive direction of the correlation indicates that there is a direct relationship between these two variables, meaning that an increase in stress level is correlated with poor blood glucose levels in the studied T2DM patient population.

Table 1
Research Variables (n = 70)

Indicators	n	%
Stress Level		
Low	8	11,4
Moderate	37	52,9
High	25	35,7
Blood Glucose Level		
Good	18	25,7
Poor	52	74,3
Total	**70**	**100**

Table 2
Relationship Between Family Support and Dietary Adherence (n = 70)

Indicators	Motivation				r	p
	Good		Poor			
	n	%	n	%		
Stress level						
Low	3	4,3	5	7,1	0,893	0,0001
Moderate	7	10,0	30	42,8		
High	8	11,4	17	37,1		

Discussion

Stress Level Among T2DM Patients

The research findings indicate that 37 respondents (52.9%) experienced a moderate level of stress. Stress is defined as the non-specific response of an organism to various demands or needs that disrupt homeostasis. This phenomenon is universal and unavoidable in the dynamics of daily life, and is therefore experienced by every individual. The impact of stress is comprehensive, affecting various dimensions of an individual, including physical, psychological, cognitive, social, and spiritual aspects. Furthermore, stress has the potential to disrupt physiological equilibrium (Derek et al., 2017).

Stressors can be antecedents to the occurrence of depression and anxiety, encompassing medical conditions such as illness, trauma from accidents, surgical interventions including abortion, and other conditions. Within the domain of medical conditions, chronic diseases and cancer are identified as pathological entities that significantly increase an individual's vulnerability to depression (Yosep, 2014).

This research is grounded in the assumption that each individual with Diabetes Mellitus (DM) exhibits a unique coping mechanism in facing stress. Individuals with effective coping mechanisms tend to be able to independently modulate stress responses. Conversely, maladaptive coping mechanisms can worsen stress levels, potentially increasing blood glucose levels. Sudden disruptions in lifestyle due to a DM diagnosis can have a significant impact on the psychological, physiological, emotional, and spiritual dimensions of an individual. Therefore, researchers recommend interventions focused on modifying or regulating cognitive patterns as a strategy to reduce stress levels in patients with DM (Hapunda, 2022). This is in line with research conducted by Vedantam et al. (2022) about Stress-induced hyperglycemia (SIH), that patients suffering from SIH usually have poor outcomes in the hospital. SIH is associated with an elevated risk of poor blood glucose level, and also it increases the risk of prolonged illnesses such as type 2 diabetes. SIH has increased the risk of T2DM after recovery.

Blood Glucose Among T2DM Patients

The study results indicated that the majority of respondents, specifically 52 individuals (74.3%), were identified as having blood glucose levels outside the normal range. Blood glucose level itself is defined as the concentration of glucose measured in blood plasma. Fluctuations in blood glucose levels are significantly influenced by several factors, including the level of psychological stress, irregular eating patterns (erratic diet), low adherence to medication regimens (for example, neglecting to take medication), and inadequate physical activity (Adam & Tomayahu, 2019).

Blood glucose homeostasis is regulated by two main hormones secreted by the pancreas: insulin and glucagon. Insulin plays a crucial role in increasing the permeability of cell membranes to glucose, which is essential for the translocation of glucose from systemic circulation into intracellular compartments. Insulin deficiency will result in impaired glucose utilization by cells. Conversely, glucagon functions to stimulate the process of glycogenolysis in the liver, which is the catabolism of glycogen into glucose, thereby increasing blood glucose levels (Galicia-Garcia et al., 2020).

Hypoglycemia, characterized by a decrease in blood glucose levels, can be induced by inadequate nutritional intake or relative hyperinsulinemia. An increase in blood glucose levels above the physiological range, or hyperglycemia, generally indicates circulating insulin insufficiency, a pathological condition known as Diabetes Mellitus (DM). A fasting blood glucose level exceeding 125 mg/dL often serves as an early indicator of diabetes. For diagnostic confirmation in cases with blood glucose levels at the upper limit of normal or slightly elevated, further evaluation is needed through postprandial blood glucose tests and/or glucose tolerance tests. There are several factors that can affect blood glucose, including physiological aging process, it can trigger systemic changes in the body's anatomy, physiology, and biochemistry, one consequence of

which is increased insulin resistance (Hinkle et al., 2022).

T2DM is caused by modifiable and non-modifiable factors. Some potentially changeable factors include gender, age, and genetics (Goyal et al., 2024). Individuals over 3 years old are susceptible to T2DM, typically marked by the vomiting of insulin amounts. From a physiological perspective, these cells are related to cells that have vomited insulin and become insulin resistant. The accumulation of insulin events, characterized by increased glucose levels in the blood, results in polyphagia, polyuria, and polydipsia. Energy is formed in the body when sugar levels are sufficient during the process of conversion to glycogenesis (Sinclair et al., 2020).

This research finding is supported by Gunawan & Rahmawati (2021) study, which presented data on the relationship between age and the incidence of T2DM ($p = 0.000$) with an odds ratio (OR) of 7.6. The study concluded that individuals older than 45 years are approximately 8 times more likely to develop T2DM compared to those younger than 45 years. Increased age is a significant risk factor for the development of T2DM. The pathophysiological mechanisms underlying this increased susceptibility to T2DM in older populations involve the accumulation of adipose tissue, particularly in the abdominal area, leading to the development of central obesity. Central obesity, consequently, induces insulin resistance, a pathological condition that is a precursor to T2DM development (Gunawan & Rahmawati, 2021). Meanwhile, Fanani (2022) reported a positive correlation between age and blood glucose levels. That study indicated that after the fourth decade of life, fasting blood glucose levels increase by 1-2 mg/dL per year. Furthermore, a more substantial increase, ranging from 5.6 to 13 mg/dL, was observed two hours post-prandial. Based on these findings, it can be concluded that age plays a significant role in the increased prevalence of DM, particularly type 2 DM, as well as glucose tolerance dysfunction.

This study's findings highlight potential other factors contributing to T2DM vulnerability in women, one of which is a more significant increase in waist circumference with age compared to men. Pooled data analysis from two population-based prospective cohort studies in Germany supports this hypothesis. The study found that a 1 cm increase in waist circumference in women correlated with a 31% increase in the annual risk of T2DM. Furthermore, a 1 kg increase in body weight in women in the same study was also associated with a 28% increase in the annual risk of T2DM (Gunawan & Rahmawati, 2021).

Diabetes Mellitus (DM) does not show a gender preference in its prevalence. However, epidemiological studies indicate that the incidence of DM tends to be higher in women compared to men. This phenomenon can be explained by women's biological vulnerability to diabetes risk factors. Constitutionally, women have a greater predisposition to experience an increase in body mass index (BMI), which is a significant predictor of DM risk. Furthermore, insulin sensitivity in muscle and liver tissues is reportedly lower in women than in men. Estrogen, the primary steroid hormone in women, plays a complex role in blood glucose regulation. Fluctuations in estrogen levels can affect glucose homeostasis, where increased estrogen levels are correlated with the potential for insulin resistance (Gunawan & Rahmawati, 2021).

The level of knowledge acquired through education significantly influences an individual's ability to engage in self-management of DM. This knowledge serves as a catalyst for improving adherence to blood glucose control protocols, implementing appropriate prevention strategies, and minimizing the risk of complications. Individuals with higher education levels tend to possess a more comprehensive understanding of DM and its health implications. This deeper understanding potentially fosters a more positive perception of diabetes management. Generally, a higher level of education correlates with a stronger foundation of health knowledge. Insight supported by adequate knowledge further enhances an individual's awareness to proactively manage and maintain their health. This phenomenon is supported by Falea (2014) research, which demonstrates that education plays a crucial role in influencing diabetes incidence and the effectiveness of prevention efforts.

Furthermore, previous study by Prajapati et al. (2018) indicated a negative correlation between the duration of DM and patients' quality of life. DM patients with a disease duration of less than one year showed optimal quality of life, while an increase in disease duration was progressively inversely proportional to quality-of-life scores. The group of patients who had DM for 10 years or more showed the lowest quality of life scores compared to other disease duration groups.

The research assumes that effective metabolic glucose control is positively correlated with achieving optimal blood glucose levels. Although stress management is an important component, there are other significant factors in facilitating adequate glycemic control. These factors include the adoption of a healthy lifestyle through regular physical activity, adherence to medication regimens, and the implementation of a therapeutic diet for diabetes mellitus. Based on this, the researchers recommend that DM patients undergo routine blood glucose level checks, particularly

through HbA1c tests four times a year, to monitor the effectiveness of blood glucose control.

Relationship Between Stress Levels and Blood glucose Levels in T2DM Patients

Based on statistical analysis using the Spearman Rank test, a significance value (Sig.) of 0.000 was obtained. This value is smaller than the established significance threshold of 0.05 (Sig. < 0.05). Thus, the research hypothesis is statistically accepted. The Spearman correlation coefficient (r) obtained was 0.893, indicating a strong correlation between stress levels and blood glucose levels in Type 2 Diabetes Mellitus (T2DM) patients at RS Bhakti Asih Brebes. The positive direction of the correlation indicates a unidirectional relationship between these two variables, meaning that an increase in stress levels is correlated with an increase in blood glucose levels in the studied T2DM patient population.

DM is defined as a chronic metabolic disorder characterized by persistent hyperglycemia, which is an increase in glucose levels in the blood. This condition is etiologically derived from a dysregulation in the balance between the supply and physiological need for glucose transport into cells, a process essential for metabolism and cellular proliferation. Hypoinsulinemia or absolute insulinopenia results in glucose sequestration in the vasculature, which consequently manifests as hyperglycemia. Simultaneously, cellular entities experience glucoprivation, a condition detrimental to their viability and functional integrity (Izzati & Nirmala, 2015).

The dependence of T2DM patients on diabetes management therapy is a challenge in itself. This condition has the potential to cause psychological problems, including feelings of asthenia due to dietary restrictions and vulnerability to stressors triggered by changes in health conditions. Significant lifestyle adaptations to maintain blood glucose balance in people with DM can be a source of stress. Stress in this context is defined as a psychological response to a perceived mismatch between individual resources and situational demands, especially when these demands are considered new, different from previous experiences, and burdensome (Izzati & Nirmala, 2015). The physiological response to stress involves an increase in adrenaline hormone levels, which triggers the glycogenolysis process in the liver, thereby increasing blood glucose levels. Hyperglycemia has the potential to trigger DM complications, both acute and chronic. The research findings of Derek et al. (2017) significantly confirm the correlation between stress levels and blood glucose levels in DM patients, with a p value of 0.000.

The research by Izzati & Nirmala (2015) indicated a significant correlation between stress levels and blood glucose levels in individuals diagnosed with Diabetes Mellitus (DM), as evidenced by a p-value of 0.017. Stress is defined as the body's physiological response to environmental stimuli that are pressuring or threatening to homeostasis. As a complex phenomenon, stress can have a wide range of impacts, including disturbances in psychological well-being and physical conditions. One manifestation of the impact of stress on somatic health is the dysregulation of blood glucose levels.

Based on result study that we have discussing, the research clearly indicates that stress management is a crucial component of effective T2DM management, In people with T2DM, who already have issues with insulin resistance or production, this stress-induced hormone release can lead to significant hyperglycemia. Prolonged or chronic stress can contribute to ongoing elevated levels of these stress hormones, potentially worsening insulin resistance over time, this creates a vicious cycle where stress leads to higher blood sugar, which in turn can increase stress levels. In essence, managing stress is not just about improving quality of life; it's also about improving blood glucose control and preventing long-term complications in T2DM

Conclusion

Based on the research objectives and the analysis that has been conducted, it can be concluded that there is a statistically significant correlation between stress levels and blood glucose concentration in individuals with Type 2 Diabetes Mellitus (T2DM) at Bhakti Asih Brebes Hospital. The quality of healthcare services for T2DM patients at Bhakti Asih Brebes Hospital is considered adequate, but health education interventions or counseling regarding T2DM need to be further optimized. This aims to reduce stress levels in T2DM patients, so that blood glucose control can be achieved effectively.

Acknowledgement

There was no conflict of interest to disclose for any of the authors involved in this study. Thank you to all the supervisors who have provided guidance and input in this research. Thank you also to RS Bhakti Asih Brebes for supporting the implementation of this research.

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