THE IMPACT OF PERCEIVED STRESS ON ELEVATED RANDOM BLOOD GLUCOSE LEVELS IN TYPE 2 DIABETES MELLITUS PATIENTS

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ABSTRAK

Stres penting karena dikaitkan dengan banyak penyakit persisten, termasuk diabetes. Penderita diabetes melitus tipe 2 bukan satu-satunya yang kadar gula darahnya dapat meningkat sebagai respons terhadap stres. Tujuan dari penelitian ini adalah untuk mengetahui apakah ada hubungan antara stres dan kadar gula darah yang berfluktuasi. Penelitian ini merupakan penelitian cross-sectional terhadap 150 pasien yang didiagnosis dengan DM tipe 2. Data dikumpulkan dari bulan Oktober hingga November 2020 di bagian rawat jalan rumah sakit swasta. Kriteria inklusi responden adalah usia minimal 18 tahun, dalam kondisi stabil, tidak terdiagnosis dengan kondisi psikosis. Tingkat stres responden dinilai dengan Perceived Stress Scale (PSS) dan kadar glukosa darah acak diukur dengan glukometer.Sebanyak 81 responden berjenis kelamin perempuan (54%), berpendidikan rendah (53,9%), dan tidak bekerja (75,3%). Terdapat hubungan yang signifikan antara stres yang dirasakan dengan kadar glukosa darah acak (p = 0,047). Stres yang dirasakan memiliki hubungan yang signifikan dengan kadar glukosa **darah acak.**

Kata kunci: stres yang dirasakan, kadar glukosa darah acak, diabetes melitus tipe 2

ABSTRACK

Stress is important because it is associated with many persistent diseases, including diabetes. People with type 2 diabetes mellitus are not the only ones whose blood sugar levels can increase in response to stress. The purpose of this study was to determine whether there is a relationship between stress and fluctuating blood sugar levels. This study was a cross-sectional study of 150 patients diagnosed with type 2 DM. Data were collected from October to November 2020 in the outpatient department of a private hospital. The inclusion criteria for respondents were at least 18 years of age, in stable condition, not diagnosed with psychosis. Respondents' stress levels were assessed using the Perceived Stress Scale (PSS) and random blood glucose levels were measured using a glucometer. A total of 81 respondents were female (54%), had low education (53.9%), and were unemployed (75.3%). There was a significant relationship between perceived stress and random blood glucose levels (p = 0.047). Perceived stress had a significant relationship with random blood glucose levels.

***Keywords**: perceived stress, random blood glucose, type 2 diabetes mellitus*

I. INTRODUCTION

The COVID-19 pandemic is a major public health crisis and has a significant impact on daily life worldwide (Acter et al., 2020). A systematic review suggested that diabetes mellitus is a one of the disease that increasing

the morbidity and mortality in Covid-19 patients (Yin et al., 2021). Diabetic complications are rather common in Covid-19 patients in Indonesia. Research demonstrates that those with diabetes are more likely to contract the Covid-19 virus (Gugus Tugas Percepatan Penanganan Covid-19, 2020)

Diabetes patients have undergone strict quarantine to reduce their risk of medical complication (Dariya & Nagaraju, 2020). Due to decreased ability to exercise, regulate their nutrition, and the decreased access of antidiabetes drugs and medical assistance during lockdown, those with diabetic may have also experienced poor glycemic control (Gupta & Bansal, 2020, 2021). On the other hands, the prevalence psychological distress is higher among patients with diabetes during the COVID-19 pandemic. One cause of stress in diabetics is the poor control they've had over their disease because of the Covid-19 epidemic (Alessi et al., 2020). Metabolic management of diabetes mellitus (DM) may be impacted by stress (Mishra et al., 2020). Chronic stress can overactivate the hypothalamic-pituitary-adrenal (HPA) axis, leading to an increase in the production of insulin counter-regulatory hormones such adrenaline and cortisol (Kelly & Ismail, 2015), which can lead to an unfavorable metabolic management of diabetes mellitus. Diabetics' glycemic levels were discovered to be altered by stress (Bhandary et al., 2013). HbA1c levels, hospitalizations, and the requirement for medical attention all went up because of the COVID-19 pandemic (Barone et al., 2021). Poor glycemic control and cardiovascular problems are linked to diabetes mellitus-related discomfort (Hackett & Steptoe, 2017). There is a lack of data on how stress affects blood sugar levels in people with diabetes during a pandemic. So, it is essential to conduct additional research into the connection between stress and blood glucose level, particularly in Indonesia. The purpose of this research is to investigate the correlation between perceived stress and fluctuations in blood glucose levels among patients with Type 2 Diabetes Mellitus during the COVID-19 pandemic. Specifically, this study aims to examine how the psychological distress experienced by diabetic patients, due to factors such as poor disease control, reduced access to healthcare, and limited physical activity, influences their glycemic control. The research seeks to contribute to understanding the impact of stress on blood glucose regulation in this population, particularly in the context of the ongoing pandemic, and provide insights into potential interventions for better managing diabetes in stressful environments.

II. METHOD

Study design

The study was conducted on 152 respondents, using a purposive sampling technique among type 2 diabetes mellitus patients. The respondents were recruited from outpatient internal medicine department in one private hospital in Yogyakarta, Indonesia.

Inclusions and Exclusions Criteria

The inclusion criteria were age minimum 18 years old, in stable condition. Patients who has been diagnosed with psychosis condition were excluded from the study.

Data collection

The data collected from October to November 2020. The researcher and research assistants were approach the patients during their waiting time to consult with the doctor. The researcher explained about the process of research and research purposes. The respondents gave their consent to participated in this study. All participants willingly provided demographic information, diabetes-related details, and stress levels via a self-administered questionnaire. Our study collects information on participants' education levels, marital statuses, employment statuses, and random blood glucose levels in addition to the more traditional measures of diabetes management and complications.

Stress Level Analysis: Perceived Stress Scale (PSS)-10

One common method of gauging stress is the Perceived Stress Scale (PSS). The questionnaire is self-administered, and it consists of ten statements concerning the respondent's emotions and thoughts over the past month, with response options ranging from "never" (option 0) to "very often" (option 4). Six of the ten questions tested stress, whereas the remaining four measured counter stress; that is, the four counter stress questions (items 4, 5, 7, and 8) evaluated the respondent's sense of calmness in the face of a stressful scenario and were scored in the opposite direction. Higher scores, up to a maximum of 40, indicated greater levels of self-reported stress. The PSS-10 is a condensed and improved version of the original PSS-14 scale, which originally contained 14 items and was determined to be psychometrically equivalent and trustworthy (Cohen et al., 1985).

Random Blood Glucose

Random blood glucose testing according to industry standards was used to determine the biochemical factors in DM. Nurses in charge took blood glucose readings at random from the participants.

Ethical clearance

This research was declared ethically worthy based on the IRB Certificate No. 036/SKEPK-KKE/VII/2020 from the one of private hospital in Yogyakarta, Indonesia.

Data Analysis

Data analysis carried out using the Statistical Package for the Social Sciences (SPSS) Version 23.0 for Windows. The correlation between perceived stress and random blood glucose calculate with spearman rho test since the data was not normally distributed.

III. RESULTS

Table 1 Characteristic of the Respondents

Variables	Category	n	Percentage (%)
Gender	Man	69	46
	Woman	81	54
Education	Low	89	59,3
	High	61	40,7
Employment	Unemployed	113	75,3
	Employed	37	24,7
DM Treatment	Oral Medication	84	56
	Insulin	36	24
	Oral medication dan insulin	28	18,7
	Diet	2	1,3

Variables	Mean (SD)	Min	Max
Age (year)	59,25 (10.21)	18	87
Number of complication	1.06 (0.90)	0	4
BMI	26,25 (5.37)	17,6	67,43
DM duration	10,2 (7.28)	3	34
Random blood glucose	162.34 (52.18)	1 7 3	323

*Education: low (elementary school to senior high school), high (college or university)
BMI: body mass index

The results of this study indicate that more than half of all respondents are women (n=81), had low education (n=89) and unemployed (n=113). The average age and BMI of the respondents was 59 years and 26,25 respectively. The average duration of diabetes was 10 years. About 24% take oral antidiabetic medication. The respondents at least had one diabetes complication.

Table 2 Respondents' Perceived Stress

Variable	Mean (SD)	Minimal	Maksimal
Perceived Stress	16,49 (4.14)	7	33

PSS-10 score ranges between 0-40 with catergories: low stress 0-13, moderate stress 14-26, and high stress 27-40. Respondents' perceived stress was in the moderate category (mean = 16.13, SD = 4.59)

Table 3 Correlation between perceived stress and random blood glucose

		Random blood glucose
Perceived stress	r	0.162
	p	0.47*
	n	150

***Spearman rho test**

There is a significant relationship between perceived stress and random blood glucose (*p* = 0.047).

IV. DISCUSSIONS

Respondents' characteristic

More over half of the participants in this survey are women, according to the findings. Because of reproductive variables, women experience more extreme hormonal and physical changes throughout the course of their lifetimes. Furthermore, the development of DM in women is influenced by body composition and fat metabolism (Kautzky-Willer et al., 2016). Respondents, on average, had a body mass index (BMI) of 26.25, making them overweight. Those who are overweight are more likely to get diabetes than those who are of normal weight (Gupta & Bansal, 2021). These findings corroborate those of (Sanada et al., 2012), who found that being overweight significantly raises one's risk of developing diabetes. Diabetes is predicted to become more common as people get older (Gupta & Bansal, 2020). According to the findings of this survey, the median respondent age was 59. Energy homeostasis is disturbed and carbohydrate metabolism is altered as a result of the aging process. Age-related decline in insulin production and progressive insulin resistance are the leading causes of hyperglycemia (Mordarska & Godziejewska-Zawada, 2017).
Participants in this survey experienced at least one diabetic problem. In this sample of patients, neuropathy was the most common adverse effect (n = 66, or 44%). The average duration of diabetes in this population was 10 years. This correlation may be attributable to the fact that carrying the weight of an illness for an extended period of time increases the likelihood of developing a mental health disorder (Sisman et al., 2021). On the other hand, respondents' reports of complications may have been linked to how long they had the disease (Table 1).

Perceived stress

Chronic diseases like diabetes mellitus have long been linked to psychological stress. Stress chemicals, such as cortisol and adrenaline, directly block insulin control, which is one of the pathophysiological pathways linking stress to diabetes (Kelly & Ismail, 2015). The average perceived stress in this study was higher than in previous studies conducted in China. which is equal to a mean of 14.1 (SD = 6.7) (Zhao et al., 2018).The study of (Zhao et al., 2018) also stated that respondents who had diabetes for more than 5 years tend to experience anxiety and women also tend to experience stress. The mean score of perceived stress in this study was higher than previous studies, possibly due to the current pandemic. More than half of the people who participated in the study were concerned that they would be overly affected by diabetes if they were infected with COVID-19, according to research by (Joensen et al., 2020). In addition, responders were concerned that COVID-19 could spread to patients with diabetes mellitus (Table 2).

Relationship between perceived stress and random blood

Perceived stress and random blood were analyzed using a bivariate correlation. The correlation between stress levels and erratic blood sugar levels was found to be statistically significant ($p = 0.047$). High levels of stress are associated with elevated blood sugar. Managing blood sugar while under stress is extremely challenging during a pandemic. During the pandemic, poor glycemic control was linked to stress and depression (Sisman et al., 2021). (Table 3). Several factors are suspected in the emergence of difficulties associated with the COVID-19 epidemic. Reasons include things like lack of funds, being forced to travel a great distance, or being placed in quarantine. Those who have not been infected with the virus are just as likely to have the mental health complications as those who have (Brooks et al., 2020). Also, stress may alter blood sugar levels either immediately by wreaking havoc on the hypothalamic-pituitary-adrenal axis or indirectly by wreaking havoc on patients' health behavior patterns including medication and nutrition compliance (Marcovecchio & Chiarelli, 2012).

V. CONCLUSION

In conclusion, the mental health of Type 2 Diabetes Mellitus (DM) patients has been significantly impacted by the COVID-19 pandemic. Psychological distress experienced during this period appears to contribute to poor glycemic control, highlighting the importance of addressing the mental health of these patients. It is essential for healthcare providers, particularly nurses, to recognize that stress perception in diabetic patients may play a key role in elevated random blood glucose levels. Therefore, regular mental health assessments should be incorporated into the care of diabetic patients,

especially during challenging times such as the ongoing pandemic, to help manage both their physical and psychological well-being.

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