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Correlation between stress level and family support towards fasting and postprandial glucose level in type 2 diabetes mellitus



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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by increased blood glucose (hyperglycemia). Stress and family's support in managing diabetic Mellitus are two critical external factors that influence blood glucose levels. This research aimed to analyze the relationship between stress level and family's support with fasting blood glucose levels and 2 hours post prandial in T2DM patients.

Method: Study design using cross sectional model. Eligible T2DM patients in Tabanan II primary health care center, between period September 2017- February 2018 were evaluated for fasting and post prandial blood glucose and stress level (Depression Anxiety Stres Scale-14) and family support. Spearman correlation test was used to determine correlation between family support and stress

level toward fasting and post prandial glucose levels in T2DM patients.

Result: The result suggested that 29 respondents (36.3%) get severe stress levels, 51 respondents (63.85%) get high family support, fasting blood glucose level was 168.42 ± 63.57 and post prandial glucose level was 229.18 ± 88.593 . There was a positive correlation between family support and stress level toward fasting glucose level ($r=0.341$; $p<0,001$) and post prandial glucose level ($r=0.276$; $p<0,001$).

Conclusion: Stress level and family support in diabetic mellitus management can influence fasting and post prandial glucose level T2DM patients. Managing stress and family support can assist in stabilizing fasting and post prandial glucose level.

Keywords: stress level, family support, blood glucose.

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INTRODUCTION

Health is fundamental matter in human life. Health problems occurring in the present time are not contagious diseases. One of them getting increase significantly and suffered by population in the world is diabetic mellitus (T2DM). T2DM is the collection of metabolic disorders characterized with occurrence of hyperglycemia or high blood sugar because of insulin secretion abnormality and its work mechanism.¹

Based on World Health Organization (WHO) in 2016 data, it predicted as many as 422 millions for adults (8,5% world population) getting DM, compared with 108 millions (4,7%).² in 2014, Indonesia was in the seventh out of ten countries in the world with the biggest T2DM patients. In Indonesia, the number of T2DM patients will increase from 9.1 million to 14.1 million in 2035.² The prevalence of impaired glucose tolerance (IGT) in Indonesia is 29,9%, causing an increase in the prevalence of T2DM because the beginning of T2DM is an IGT condition. Indonesia's basic health research data showed in 2007, the prevalence of T2DM was 5.7% and became 6.9% in 2013.⁴

Meanwhile, another registration sampling data from Indonesia Ministry of Health shows crude mortality of T2DM related complication was 6.7%.⁴ Data from Bali Province Health Department in 2017's shows Tabanan regency with the highest number of T2DM patients (4.995 patients).

There are 4 ways that can be used to restrain and manage T2DM such as education, diet, physical activity (sport), and pharmacotherapy. The main purpose of T2DM management is to normalize glucose level in the blood therefore it can reduce micro and macroangiopathy related complications in T2DM. Optimal control of T2DM not only concern of the individual condition but also involvement of the family as the closest persons for the patients who become accompaniment in getting therapy for T2DM.⁵

Family support can assist patients in adapting to any unexpected situation. The existence of family support can assist in maximizing T2DM management. The acceptance in family support is expected to control blood glucose levels in T2DM patients in performing lifestyle and diet changes. Family knowledge is the essential thing that affects

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the management of a diabetic patient. Family knowledge about diabetes should be measured in a broader concept, such as social support, coping, and adaptation.⁷

Also, family support can also increase obedience of T2DM patients in performing T2DM management. The support given by the family is the most important for the patient as a unique individual behavior that supports in diabetes management.⁷

Chronic and long life management of T2DM, often accompanied by an increase in individual stress levels. Depression stimulates body biochemistry reaction through two mechanisms, they are neural and neuroendocrine. The first reaction of stress response is the sympathetic neural system's reaction to release norepinephrine and

Therefore, stress management for T2DM patients is very important to prevent blood glucose levels.

The best time for blood glucose level examination is fasting blood glucose two hours of post prandial, hereafter it will be called 2 hours fasting blood glucose level of post prandial. Fasting blood glucose level examination is one of the criteria to diagnosed DM, one can be categorized to have T2DM if the fasting blood glucose level is not less than 140 mg/dl after twice blood sugar examination.⁸

Our preliminary study in Tabanan II Primary Health Care, and interviewing five T2DM patients, shows two of five patients said to have experienced depression because the disease cannot be cured. Two of five patients did not get any support from the family to consume any food as they like, which made their blood glucose level become high.

Based on mentioned background, the researchers were very interested in performing research about the relationship between stress level and family support in DM management with fasting blood glucose level and 2 hours of post prandial in type II DM patient.

METHODS

Study design and population

Study design used cross sectional model. The population in the study were T2DM patients listed in outpatient clinic Tabanan II Primary Health Care Center, between September 2017 to February 2018. All samples were recruited using consecutive method (non-random sampling). Blood sugar measurement was carried out in fasting (8 hour fasting) and 2 hour post prandial using rapid test glucometer (sample from finger tip blood).

Stress level and family support

The stress level was measured with stress level questionnaire driving from Depression Anxiety Stress Scale (DASS 14) instrument, and family support was calculated with questionnaire driving from Nursalam et al.⁹ which have demonstrated acceptable in validity and reliability in both stress level and family support questionnaire instrument. This sample's distribution of stress level was skewed toward No stress (skor 0-14), mild Stress (skor 15-18). Moderate pressure (skor 19-25), severe stress (skor 26-33) and stress are very heavy (skor \geq 34). The distribution of family support for this sample categorized in high family support (skor 60-80), medium family support (skor 40-59.9) and low family support (skor 20-39.9).

Statistical analysis

Data analysis was analyzed using SPSS version 25.0 (IBM Corp, Armonk, NY-USA). Spearman

increase heart rate. Stress is an influential factor for DM patients, increase in stress hormones could alter blood sugar levels. The relaxed condition can return the hormone system of contra regulation and enable the body to use insulin more effectively.

Table 1. Descriptive characteristic of the sample

Characteristic	f	%
Age (year)		
<25	1	1.3
36-45	5	6.3
46-55	28	35.0
56-65	25	31.3
>65	21	26.3
Sex		
Male	36	45.0
Female	44	55.0
Length of DM suffering (year)		
1-5	49	61.3
6-10	20	25.0
11-15	6	7.5
16-20	2	2.5
>20	3	3.8
Stress level		
No stress	8	10.0
Light	19	23.8
Medium	11	13.8
Severe	29	36.3
Very severe	13	16.3
Family support		
Light	4	5.0
Medium	25	31.3
High	51	68.8

Table 2. Distribution frequency of blood glucose level

Glucose	Min-Max	Mean	SD
Fasting blood glucose	92-400	168.42	63.57
2 hour post prandial	105-519	229.18	88.593

Table 3. Correlation of stress level and family support with blood glucose level

Variable	N	Coefficient Correlation	p-value
Stress level with blood glucose level			
Fasting blood glucose	80	0.324	0.003
2 hour post prandial blood glucose	80	0.353	0.001
Family support with blood glucose level			
Fasting blood glucose	80	-0.492	0.000
2 hour post prandial blood glucose	80	-0.428	0.000

Table 4. Correlation of stress level and family support with blood glucose level

Blood glucose	p-value	r
Fasting blood glucose	0.000	0.341
2 hour post prandial	0.000	0.276

correlation tests were used to measure the correlation between family support and stress levels towards fasting and post prandial blood glucose levels. All statistical analyses were considered significant if $p < 0.05$.

RESULT

Sample Characteristic

Sample characteristics are presented in Table 1, for demographic characteristics, the age of most samples in the age range 46-55 years (35%), over half were female (55%), disease duration mostly between 1-5 years (61.3%), most with severe stress level (36.3%), and most with high family support (68.8%).

Table 2 showed that mean (SD) of fasting blood glucose is 168.42 (63.57) mg/dl and mean (SD) of 2-hour postprandial glucose level is 229.18 (88.593) mg/dl.

Bivariate Relationship Between Variables

Table 3, showed that there is a significant correlation between stress levels with fasting blood glucose levels in T2DM ($r=0.324$; $p=0.003$) and post prandial glucose level ($r=0.353$; $p=0.001$). Significant negative correlation between family support toward fasting glucose level ($r=-0.492$;

$p < 0.001$) and post prandial glucose level ($r=-0.428$; $p < 0.001$).

In table 4, combined model of family support and stress were ruled out, significant correlation between family support and stress level toward fasting glucose ($r=0.341$; $p < 0.001$) and post prandial glucose ($r=0.276$; $p < 0.001$).

DISCUSSION

According result of the study, majority 36.3% respondents were in the severe stress. A study by Labinjang et al.¹⁰ shows stress is a factor playing an important role in diabetic mellitus, which produces stress hormone increasing blood glucose levels. Relaxed condition can bring back the function of counter-regulation hormone into normal and enable the body to use insulin more effectively. Stress influence to blood glucose level increase is related to neuroendocrine through hypothalamus and pituitary-adrenal.

Respondents who got severe stress were caused by physical change factors and life problems such as economic problems coming in the life. The existence of T2DM disease can change physical ability hence the respondents cannot do their routine activities. This condition influences economy matters. Respondents getting severe stress often feel hungry hence their appetite gets increased, restless when they sleep, talk less than usual.

Family's support in T2DM management

The research result about family support in T2DM management of 80 respondents shows that most respondents had a high family support level. Another similar findings by Arif et al.¹¹ study, there were 90 T2DM respondents with high family support. Meanwhile, Amadi et al.¹² study show that family support levels are significantly associated with medication adherence, old age, and glycemic control among T2DM patients.

Family is the closest person for the patients hence good support can give much advantage for the condition experienced by the patients. The functions are to control blood glucose levels and to reduce stress levels occurring in the patients. The family has responsibilities, daily and routine responsibilities renegotiating the role of family due to diabetes management.¹³

The support given by the family is the most important thing on how the patients can understand the given support for themselves. Unique individual behavior is one that supports success in diabetes management.⁷

The relationship between stress level and family's support in fasting blood glucose in T2DM management

The current study shows a significant correlation between family support and stress levels toward fasting glucose among T2DM patients.

Stress could be an important factor for T2DM patients, the produced stress hormone increase can make blood glucose level get increase. Relaxed condition can normalize stress hormone contra regulation and enable the body to use insulin more effectively. Stress influences blood glucose levels, it is related neuroendocrine system through hypothalamus, pituitary-adrenal axis.

Good family's support influences T2DM adherence therapy. As another research suggested that family support is related to patient's obedience in applying T2DM.¹⁴ Good family support will support the practice of therapy programs hence it will reduce blood glucose level. According to Isworo et al. the most dominant factor influencing blood glucose level is family's support. In addition, the program of patient diet practice is very important to do at home because family's support can reduce patient's stress level.¹⁵

Fasting blood glucose level increases because when fasting is done, body does not get any caloric intake for approximately 8 hours. Normally, alpha cell in pancreases keeps producing glucose when fasting. However, glucose cannot enter into the cell instead of accumulating in the blood vessel because the insulin receptor is not sensitive or resistant from insulin. Even though alpha cell keeps producing glucose, cells feel hungry and brain system give signals that brain and cell get food deficiency, it makes the sensitivity of lipase hormone becomes active and it stimulates the occurrence of lipolysis process. This process results in fatty acid and glycerol which will be changed into glucose to fulfill body needs. Those processes cause fasting blood glucose level in T2DM tend to increase.¹

Stress Level and Family's Support in DM Management with 2 Hour Blood Glucose Level of Post Prandial.

The current study shows a significant correlation between family support and stress toward post prandial glucose levels among T2DM patients. Stress level is correlated with the poor blood sugar regulation. There are some stress mechanisms which can contribute to glucose metabolism. Stress disturbance influences axis hypothalamic-pituitary-adrenal and can trigger excess cortisol secretion. When stress condition happens, the body will secret some hormone, which will affect blood glucose levels. ACTH will stimulate pituitary anterior to

produce glucocorticoid especially cortisol. Cortisol increase will influence bold sugar level increase.⁸ In addition, cortisol can also inhibit glucose uptake by body cells.

Good family's support will influence the practice of T2DM therapy program performed by the patients. As another research stated that family support is related to patients' obedience in applying T2DM diet.¹⁴ Good family support will support the practice therapy program therefore, it will reduce blood sugar level.

CONCLUSION

There is a relationship between stress level and fasting and post prandial blood glucose level in T2DM patients. Education on stress management in individuals and emphasizing the importance of the family's role is something that deserves attention in the management of T2DM.

CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding publication of the article.

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ETHICAL CONSIDERATION

All participant has been signed written informed consent prior to any data collection. All study protocols in accordance to declaration of Helsinki.

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