Relationship between depression and stress with blood sugar levels in patients with diabetes melitus type II

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Abstract
Background: Non-infectious disease (NID) has become a problem of public health in global, regional, national and local aspects. This research aimed to determine the relationship between depression and stress with blood sugar levels in patients with DM Type II post-disaster.
Methods: This type of research was quantitative by using cross sectional design. The population was all patients with DM Type II, comprising 1624 outpatients. Data were analyzed using univariate and bivariate analysis at a degree of confidence of 95% (α = 0.05).
Result: The results of the chi-square test show depression (ρ=0.007), and stress (ρ=0.000), associated with blood sugar levels. It is hoped to provide services and monitoring of post-disaster psychological conditions, especially in patients with DM Type II in order to suppress psychological disorders until they do not harm the disease.
Conclusion: There is a relationship of depression and stress with blood sugar levels in patients with type II DM.

Keywords: depression, stress, blood sugar levels

INTRODUCTION

Non-infectious diseases (NIDs) have become a global, regional, national and local public health issue. The characteristics of most NIDs are chronic and long term. NID will not heal as before and even tends to get worse. One of the most important NIDs is diabetes mellitus (Bloland, et al. 2012). Diabetes mellitus (DM) is a chronic disease triggered by inherited and/or acquired deficiencies in pancreas insulin production and/or by insulin ineffectiveness.8 DM has been a significant source of blindness, kidney failure, heart disease, stroke, and diabetic amputations (Adha, et al. 2019). Type II diabetes is a type of diabetes often found in the world. The proportion of incidence of Type II DM is 95% of the world population, and only 5% of this number suffers from Type I diabetes and others (Olokoba, Obateru, & Olokoba 2012).

The number of patients with DM in 2018 was 424.9 million, and it is estimated that in 2040 will increase to 642 million patients. The prevalence of type II DM will increase with age and lifestyle changes that tend to be unhealthy (Ogurtsova, et al. 2017). The number of people with diabetes mellitus in Indonesia is estimated at around 10 million people with a prevalence rate of 6.2%, and this disease is one of the causes of death in Indonesia. Hence, this caused Indonesia to occupy the top ten with the highest rate of diabetes mellitus in the world in 2013 (Nugroho, et al. 2020). According to the results of the Basic Health Research in 2018, the highest ranks were found in Jakarta (2.6%), Yogyakarta (2.4 %), North Sulawesi (2.3%), East Java (2.0%), Bangka Belitung (1.8%), Aceh (1.7%), Gorontalo (1.7%), Central Java (1,6%), Banten (1.6%), and Central Sulawesi (1.5%), and the lowest was in East Nusa Tenggara (0.6%) (Riskesdas 2018). Talise Health Center is a community health service center affected by the disaster, especially the earthquake and tsunami in the Mantikulore District area. The discovery of DM cases in 2015 were 144 cases, in 2016 there were 239 cases, in 2017 there were 372 cases, and in 2018 there were 297 cases. Whereas, based on outpatient visits of patients with type II DM in 2015, there were 882 cases, in 2016 there were 1087 cases, in 2017 there were 1684 cases, and in 2018 there were 1,624 cases.

DM is a chronic disease requiring lifelong therapeutic interventions, especially DM type II and can be suppressed by controlling blood sugar within normal limits. This disease will accompany patients for life.

Hence, it will affect psychological aspect of the patients (Blaslov et al. 2018). In anxious conditions, stress and depression in patients with type II DM will trigger hormones in the body, especially the hormone cortisol, which has the effect of increasing blood sugar levels, and elevated blood sugar levels that fluctuate will cause patients to experience despair in treatment (Eashwar, Gopalakrishnan, & Umadevi 2017). This is challenging to maintain a well-regulated condition for DM type II, as it calls for improvements in behavior, such as dietary patterns, proper weight care, daily activity and autonomous blood sugar testing (Amelia et al. 2018). The risk of psychological distress is elevated in patients with chronic illness. In addition to negative impacts on quality of life, psychological symptoms also have prognosis of a disease, including death, morbidity, and service usage (Permatasari, Thamrin, and Hanum 2018).

In psychological aspects such as psychiatric, mental, psychological problem, the disease leads to stress disorder after natural disasters that cause deep trauma received less attention. Stress due to trauma affected by natural disasters experienced by victims can cause psychological effects, such as anxiety, depression, psychosis, and even victims can commit suicide (Makwana 2019). Some elements of diabetes may influence or expose patient quality of life, symptoms of rising or dropping blood sugar, and the fear of complications (Firdiani, Zulkifli, and Nyorong 2018). This study aimed to determine the relationship between depression and stress with blood sugar levels in patients with type II diabetes mellitus after the disaster at Talise Health Center, Palu City, Indonesia. This is the first study, especially in the Palu city after a disaster that measures the psychological relationship (depression and stress) to blood sugar in DM patients.

MATERIALS AND METHODS

Research Design, Population, Samples and Variables

This was a quantitative study with cross-sectional design. This research was conducted in February-March 2019. The study population was all outpatients DM type II in General Poly with a total of 1624 patients, and the number of samples studied was 91 taken by accidental sampling.

Instruments

The data collection technique of this study was a direct interview with a questionnaire guide. Depression, anxiety, and stress were assessed using the Depression, Anxiety, Stress Scale 42 (DASS 42) questionnaire issued by the *Australian Psychology Foundation*. The questionnaire used was a translated version of DASS 42 into Indonesian (9). There were 14 items to measure depression, anxiety, and stress in this questionnaire. There is a score of 0-3 for each question.
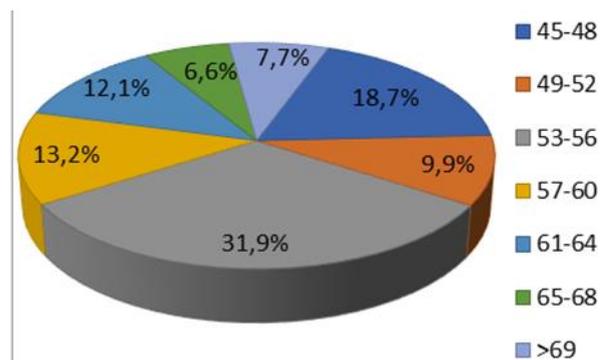

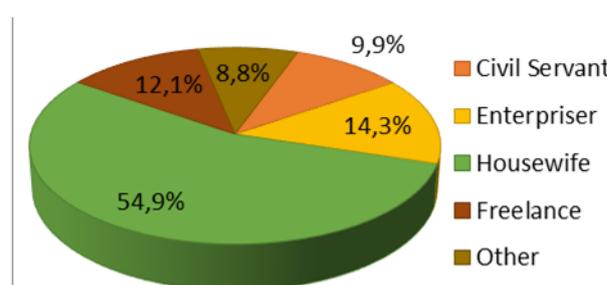**Fig. 1.** Distribution of Respondents Based on Age

Fig. 2. Distribution of Respondents Based on Occupation

Total values for each category of depression, anxiety and stress declared not depressed/anxiety/stress are ≤9, ≤7, and ≤14, respectively.

Research Procedures and Analysis

All respondents were given an explanation before signing the informed consent. The researchers also provided assistance during the process of filling out and explaining the questionnaire. The obtained data were analysed through process of editing, coding, and data entry. Statistical analysis was performed using spss16 (IBM, San Francisco). Then data were analysed using univariate analysis to see the relationship between dependent and independent variable. Bivariate analysis was designed using chi-square test with level of confidence (α) 5% and confidence interval (CI) 95%.

RESULTS

Characteristics of Respondents in Talise Health Center

Frequency distribution based on age group in Talise Health Center showed that most of the cases were found in the age range of 53-56 years-old as much as 31.9% (**Fig.1**). Frequency distribution based on work at Talise Health Center showed that the most respondents occupation was as house wife of 54.9% (**Fig. 2**).

Frequency distribution based on sex in the Talisee Health Center showed that the majority were female at 74.7% compared to male at 25.3% (**Fig. 3**).

Frequency distribution based on the most recent education at Talise Health Center showed that the
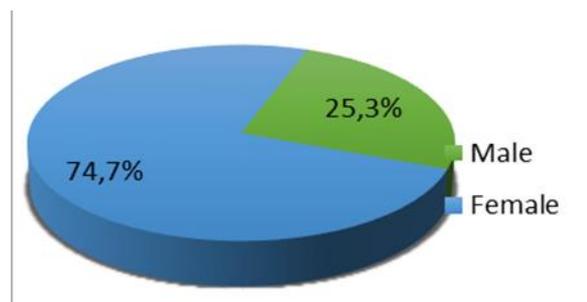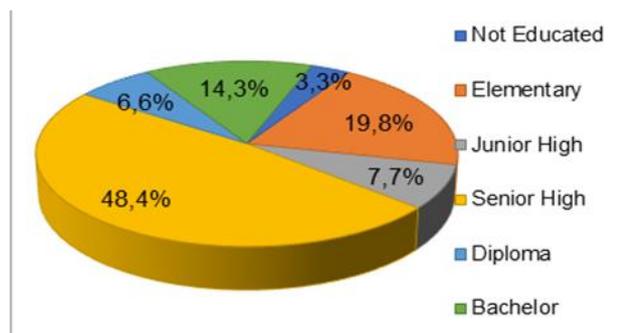
Fig. 3. Distribution of Respondents Based on Sex

Fig. 4. Distribution of Respondents Based on Education

Table 1. Relationship between Depressioon and Stress with Blood Sugar Levels in Patients with Diabetes Mellitus Type II Post-Disaster

Variables	Blood Sugar Levels				Total		P
	Abnormal		Normal				
	n	%	n	%	n	%	
Depression							
Not Depression	12	35.3	22	64.7	34	100	0.007
Depression	38	66.71	19	33.3	57		
Stress							
Not Stress	4	9.8	37	90.3	41	100	0.000
Stress	46	92.0	4	8.0	50		

majority of respondents had a high school education of 48.4% (**Fig. 4**).

Relationship between Depression and Stress with Blood Sugar Levels in Post-Disaster Patients with Type II Diabetes Mellitus in Talise Health Center, Palu City

Table 1 shows that there is a relationship between depression with blood sugar levels with a value of p = 0.007. A total of 12 respondents who did not feel depressed had abnormal blood sugar levels (35.3%), and as many as 38 depressed respondents had abnormal blood sugar levels (66.71%.). Meanwhile, as many as 22 respondents who did not feel depressed had levels normal blood sugar (64.7%), and as many as 19 respondents who felt depressed had normal blood sugar levels (33.3%).

The relationship between stress and blood sugar levels showed a value of p = 0.000. This proves that there is a significant relationship between the stress levels with blood sugar levels. A total of 4 respondents who did not feel stress had abnormal blood sugar levels (9.8%), and as many as 46 respondents who felt

stressed had abnormal blood sugar levels (92.0%). Whereas, 37 respondents who did not feel stress had abnormal blood sugar levels (90.3%), and as many as 4 respondents who felt stress had normal blood sugar levels (8.0%).

DISCUSSION

Natural disaster events are events that are difficult to avoid and predict as quickly as possible. Disasters may have an effect on health, properties, infrastructure destruction, socioeconomic environments, and the lives of existing societies. Victims of natural disasters face situations and conditions that are very complex physically, psychologically and socially. Disaster victims who feel prolonged sadness also tend to have a high risk of suffering from certain psychological disorders such as depression (Goldmann & Galea 2014). Depression has a close relationship to diabetes. The prevalence of depression in patients with diabetes is two times more likely than for the general population. Depression is associated with high levels of glucocorticoids, catecholamines and growth hormones, glucose-transport changes and secretion of inflammatory cytokines, which may lead to resistance to insulin and eventually become factors, leading to diabetes and diabetes complications (Amelia and Yunanda 2018).

The 53-56 years-old-group is more depressed due to growing ages that double the risk of depression. This is because at that time, a lot of changes occur in a person. As people get older, they also experience various problems, ranging from job loss, loss of purpose in life, and risk of disease. This can trigger a mental disorder, and the most often found is depression. Based on the characteristics, female tend to get more depressed because, according to some studies, women do have a higher risk of depression compared to men with a ratio 2:1. The female elderly are more susceptible to depression compared to the male elderly. This is because the impact of biological changes, especially hormonal and psychosocially. Women prefer many roles to be carried, which can be stressors and lead to depression (Motjabai, 2014).

Based on the results of the study, it showed that there was a relationship between depression and blood sugar levels. This is because patients or survivors still feel deep sadness after the disaster passed. Most of them lost their loved ones, property, and work because some of them depends their livelihoods around the coast of Talise, which was the worst point of the tsunami. Depression in people with DM gives the effect of not complying with the control of treatment so that blood sugar levels become uncontrolled. In addition, the age suffer from DM are mostly in the pre-elderly category, where function and integration begin to decline. Ability and activity have begun to decrease, thus various complications arise in patients with DM. The burden of

complications and care that must be carried out lifelong make the sufferers vulnerable to depression (Bădescu, et al. 2016).

Depression in people with type II DM will trigger the cortisol hormone. As the cortisol hormone has an effect in increasing blood sugar levels, fluctuating blood sugar levels that increase will cause patients to experience despair in treatment (Eashwar, et al. 2017). Dealing with depression requires training in fighting against every negative thought that arises with positive thinking. Positive thinking plays the role of feeling and one of them is prejudice. Having good prejudice is done by taking the positives from bad things that happen. Positive thoughts can bring confidence, health, and success in every situation and action. In addition to avoiding depression, other means of physical activity such as doing body movements can also increase metabolism and increase body temperature and trigger a calming effect on the central nervous system. When actively moving, the body helps the process of endorphin hormone secretion which can improve mood (Rebar, et al. 2015).

In the 53-56 years-old age group, people tend to experience more stress because as they get older, they will experience setbacks, especially in the field of physical abilities, resulting in disruption in life. Furthermore, it can affect the Activity of Daily Living (ADL), which is the ability of a person to take care of himself starting from waking up, taking a shower, dressing, and so on. It is increasing the needs of help of others. Changes or setbacks experienced are very stressful, both for good and for bad (Van Dijk, et al. 2013).

There was a relationship between stress and blood sugar levels in this study. This is because people with type II DM feel a mismatch between their abilities and the demands of medication control that must be carried out. The discrepancy that occurs is that the patient is a victim of a disaster that loses property, loved ones and even jobs that can put pressure on their lives, and they are unable to control demands. Stressed sufferers tend not to care about the treatment that must be run by people with type II DM, Consequently, blood sugar levels increase (Aloudah, et al. 2018).

It is the higher the stress, the higher the blood sugar level. Stress causes overproduction of cortisol, which works against the effects of insulin and causes high blood sugar levels. If a person experiences severe stress produced in his body, the resulting cortisol will be produced more and can reduce the body's sensitivity to insulin. Cortisol is an inhibitor of insulin function, making blood sugar levels more difficult to enter cells and increasing blood sugar levels (Mcewen, 2009). The level of stress occurring in patients with type II DM will affect to maintain normal blood sugar levels. When a stress situation arises, the stress response can be in the form of an increase in the adrenaline hormone which can ultimately convert glycogen reserves in the liver into glucose (Marín-Peñalver, et al. 2016). Patients with type II DM who are stressed with abnormal blood sugar levels includes in the level of disability limitation prevention. For patients with type II DM, motivation is needed to comply with DM control plans in the state of stress (Rifka Pahlevi, Suhartono Taat Putra 2017). The health agencies, especially Talise Health Center, will be able to make a policy related to service and monitoring of post-disaster psychological conditions on health center visitors, especially patients with type II DM, in order to reduce psychological disorders so as not to endanger the disease.

This study only examines the relationship of depression, anxiety, and stress with blood sugar levels in patients with type II DM after disaster, while there are still other factors that can affect blood sugar levels but are not examined in this study, such as knowledge, eating arrangements, adherence in taking medication, controlling blood sugar, and physical activities.

CONCLUSION

Based on the results of the study, it can be concluded that there is a correlation between depression and stress with blood sugar levels in patients with type II DM in Talise Health Center, Palu City, and it is hoped that in the future other researchers able to receive deeper data through interviews. Other factors related to blood sugar levels are knowledge, eating arrangements, drinking arrangements, blood sugar control, and physical activities.

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