Psyhological Response and Ntritional Status of Type 2 Diabetes Mellitus Patients

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ABSTRACT

The application of nutrient guidelines into daily menu challenges the majority of type 2 diabetes mellitus (T2DM) patients as it needs time to change their dietary habit that has been previously formed. It is common for patients to experience boredom and stress due to their diet program that has to be implemented for the rest of their lives. Psychological response has a great influence in T2DM patients in their effort to control their diet. This research aims to analyze psychological response and nutritional status, also to observe their relationship in T2DM patients. This research uses cross sectional design. It is applied on three type A hospital in Jakarta by consecutive sampling, with 260 type 2 diabetes mellitus patients as respondents. Questionnaire is used to collect the data. There is a significantly related between psychological response and nutritional status (p = 0.000, OR =4.944) that is not influenced by confounding variable such as anti-diabetic medication, food intake, and age. Respondents with diabetes distress psychological response have 4,944 times higher risk of experiencing abnormal nutritional status compared to respondents without diabetes distress. Regular meeting is needed at least once every four weeks to fulfill psychological needs concerning diabetes.

Keywords: Banjir, T2DM, Diet, Psychological Response, Nutritional Status.

INTRODUCTION

Diabetes Mellitus (DM) is one of major global public health problems. The number of the case is increasing in the past few decades (1). Indonesia is in the 6th place of highest number of DM patients in the world (2). T2DM is the most common type of DM: 90% of all diabetes cases in the world (3).

Apart from the physical problems caused by DM such as complications, patients may also experience psychological response such as anxiety, irritability, feeling guilty, and depression (4). Psychological response affects DM patients in managing their diabetes, as stated in a meta-analysis study by (5) of 47 research on 17,000 samples; depression significantly affected patients' willingness to manage their diabetes. The mean correlation was 0.18 between depression and unwillingness to manage patients' diet. A longitudinal study towards 11,000 T2DM patients showed that depression resulted in glycemic control worsening in the span of 9 years (6). Stress in patient would lead to higher HbA1c level and could increase the mortality rate. The patients also demonstrated poor metabolic control (4).

The result of cross sectional study on 3,432 T2DM patients in 13 countries by *Diabetes Attitudes, Wishes and Nedds* [DAWN] (7) showed that 41% patients had bad psychological response and 12% patients got psychological treatment (8). The result of meta-analysis study on 42 research stated that the proportion of depressed individual was twice as big in

the group with diabetes compared to the group without diabetes (9) .

Diet control is one of diabetes managements that aim to maintain glycemic control (10). Diet is one of the pillars of managing DM that are important to follow in the long run and to lower HbA1c level as much as 1%-2% which can prevent or delay complications (11). A study on 185 patients with type 2 diabetes mellitus indicated a between between patients who followed the recommended diet and reduced HbA1c level as well as less chronic complication from diabetes (12).

The application of nutrient guidelines into daily menu is a challenge for the majority of diabetes patients because it needs adaptation and willingness to change patients' dietary habit (13). Diet often causes boredom and stress since diabetes patients have to follow the diet program for the rest of their lives. Most patients are disappointed with the recommended diet. They have difficulty in applying the recommendation into their daily lives (14).

The result of this study shows that only 63% patients maintain their diet well (8). A different result stated that more than 50% patients did not follow the recommendation (15). Patients often reported pressure as psychological response such as stress, depression, anxiety, and irritability concerning the recommended diet. They tended to stop maintaining their diet (16). A study towards 356 type 2 diabetes mellitus patients showed 41.3% of them were too strict in doing their diet program and it disturbed their needs of nutrients (17).

Patients are often unsure of the type of food they can have. It causes an improper limitation that leads to nutrition

disturbance (18). Unwillingness to manage their diet can lead to negative effects such as nutritional disturbance or malnutrition. Malnutrition is a cellular imbalance between nutrition and energy supplies and our needs. It can be in the form of undernutrition, specific deficiency, overnutrition, and imbalance (19).

Malnutrition occurs in three million DM patients in England (20). An individual's nutritional status can be tested using Body Mass Index (BMI) to determine the status of underweight, overweight, and obesity. The status of underweight is found in DM outpatients, based on BMI 2%-2.7% (21).

Malnutrition causes complication and delayed healing process, an increase in infection and muscle loss, slower wound healing, and increasing morbidity and mortality rates. Malnutrition is caused by several factors such as physical conditions (dentures that do not fit properly), social conditions (low income, limited knowledge concerning diet, substance abuse), medical conditions (eating disorder, cancer, dementia), as well as psychological conditions that are common in diabetes patients (18).

Different study results above show that psychological response affects patients' attempt in maintaining their diet. There are various research previously conducted concerning psychological response but the researcher has not found any research that specifically inspects psychological response and its between with nutrient in DM patients at the same time. Therefore, the relationship between psychological response and nutritional status in DM patients needs to be observed.

Table 1 Respondent's Demographics Characteristics (N= 260)

Variable	N	%
Age (years)		
<60	126	48,5
>60	134	51,5
Gender		
Female	136	52,3
Male	124	47,7
Food Intake		
Sufficient	138	53,1
Not Enough	81	31,2
Over	41	15,8
Anti Diabetic Drugs		
OADs and Insulin Combination	27	10,4
OADs	152	58,5
Insulin	81	31,2
Comorbidities		
No comorbidities	32	12,3
Hypertension	143	55,0
Diabetic Retinophaty	4	1,5
Stroke	15	58
Renal Malfungtion	22	8,5
Foot Ulcer	10	3,8
GastroIntestinal Disease	12	4,6

OBJECTIVE

The purpose of this study was to analyse the relationship between psychological response and nutritional status in patients with T2DM.

METHODE

Research Design

This is a quantitative research with cross sectional design that analyzes psychological response, nutritional status, and analyzes their relationship in T2DM patients.

Sample and Location

This study is conducted in three type A hospital in Jakarta. The research population for this study is all T2DM patients in those hospitals. The sample is T2DM patients who visit endocrine polyclinic there. The number of sample needed in this study is counted based on cross sectional design, where 260 people are counted as sample.

Non probability sampling is used as sample collection technique where selected respondents who fulfill the criteria are chosen by the researcher until the desired number of respondents can be obtained. The requirements for inclusion criteria include a T2DM patient; has HbA1c level on a medical record; good verbal communication; able to read, write, and speak in Bahasa Indonesia; and is willing to be a respondent for this research. Exclusion criteria that should be paid attention include: patient having

edema and ascites, as well as abnormality in the bone observed from the respondent's body posture.

Measuring Instrument

Data collection uses anthropometry measurement instrument, patient demographic questionnaire, Problem Areas in Diabetes (PAID) questionnaire, food intake measurement by food recall questionnaire.

Anthropometry measurement, involving weight and height data, is to evaluate body mass index (BMI) as a foundation of sample collection. Weight data collection is conducted by digital scale with the capacity of 150 kg and the graduation of 50 grams. This scale is brought by the researcher in new condition from the manufacturer, and is calibrated by the Indonesian Ministry of Health with decision number 1090 1616276 printed on the package. Data of height are obtained using Microtoise Staturmeter (an instrument for measuring height) owned by the hospital. It has the capacity of 2 meters with the graduation of 0.1 cm. This instrument is also calibrated by the hospital and functions well.

Instrument of patient demography questionnaire aims to find out respondents' personal information such as age, gender, type of anti-diabetic medication, and comorbidity filled by the researcher.

Questionnaire used to measure psychological response in T2DM patients is Problem Areas in Diabetes (PAID) (22). PAID instrument has good validity and reliability with alpha cronbach ≥ 0.93. This instrument is able to measure various emotional problems and show stronger focus on diet and complication of diabetes (23) . As the researcher wants to find out diabetes patients' psychological response, especially on diet, the researcher chooses this questionnaire as a measurement instrument for psychological response. This instrument has been back-translated from Bahasa Indonesia to English by Lembaga Bahasa Internasional (International Language Institute) in University of Indonesia to maintain the content. This questionnaire has been tested for its validity and reliability to 30 respondents in endocrine polyclinic in a type A hospital in Jakarta. PAID questionnaire has the value of validity test with r on the scale of $0.442 - 0.849 > r$ table (0.361), with all valid statements. The value of reliability is r alpha Cronbach $=0.952$. This questionnaire has 20 items of statements and the number of the answers from all statements ranges from 0 to 100. The final result of measurement is categorized into 2 groups: a group with no diabetes distress and a group with diabetes distress with the score

Table 2 Respondents' Psychological Response and Nutritional Status (N= 260)

Item	N	%
Psychological Response		
No Diabetes Distress	126	48.5
Diabetes Distress	134	51.5
Nutritional Status		
Normal	113	43.4
Abnormal	147	55.8

≥ 40.

1x24 hours food recall instrument form is used to find out the respondents' food intake in the last 24 hours. The form contains a table consisting of time and food type columns, food ingredient column, as well as a column for a sum divided into two sub-columns of household size with the weight counted in grams, and unit in calorie. The data from 1x24 hours food recall will be assessed using computer software named nutrisurvey.

Data Collection and Procedure

The data used in this research include primary data from respondents' direct answer and secondary data from medical records. This research is started by submitting a request for research permit letter and ethical review application from each research location. After meeting the requirements of the place of research, in collecting the data for the study, the researcher is assisted by two enumerators, college students of nursing bachelor program.

The researcher collects respondents based on the inclusion criteria, 260 respondents, using consecutive sampling and explains the purpose of the research. Respondents who are willing sign the informed consent. Then, the researcher checks their anthropometry measurement such as weight and height measurement. After

that, the researcher asks them to fill up the Problem Area in Diabetes questionnaire for around 10-15 minutes, accompanied by the researcher or the enumerator. The researcher then interviews them to evaluate their food intake using 1x24 hours food recall. The amount of food will be noted in the form of household size that is converted into grams. The result of the study is then analyzed.

Statistical Analysis

Data analysis in this research includes univariate and bivariate analysis. Univariate analysis describes variables of age, sex, food intake, the type of anti-diabetic medication, comorbidity, psychological response, and nutrition status with percentage or proportion measurement. Bivariate analysis aims to observe the between between two variables, that is, to prove the research hypothesis of the between between independent variable (psychological response) and dependent variable (nutritional status). Statistical test used is Chi Square test with 95% confidence interval or α 0.05. Bivariate analysis is used to test the confounding variable (age, food intake, the type of anti-diabetic medication, comorbidity) in its relation with nutritional status using chi-square test with 95% confidence interval or α 0.05.

RESULT

The result of this research describes

Table 3 Relationship Between' Psychological Response and Nutritional Status

Psychological Response	Nutritional Status				OR (95% CI)	p value
	Abnormal		Normal			
	n	%	n	%		
Diabetes Distress	100	74,6	34	25,4	4,944	0,000*
No Diabetes Distress	47	37,3	79	62,7	(2,908-8,406)	

respondent distribution based on demographic characteristics such as age, sex, food intake, the type of anti-diabetic medication, the duration of diabetes, comorbidity, as well as the distribution of the main variables: psychological response and nutritional status.

The majority of the respondents, 134 people (51.5%), are in the age group of >60 years old. Most respondents, 136 people (52.3%), are female. Based on the type of anti-diabetic medication used, 152 respondents (58.5%) use oral medication. The food intake of around 138 respondents (53.1%) suffices their calorie needs. The most common comorbidity in respondents is hypertension: 143 respondents (55%) have it. This can be seen in Table 1.

In psychological response variable, 134 respondents of this study (51.5%) have diabetes distress. Respondent distribution based on nutritional status indicates 132 respondents (43.5%) show nutritional status more than the normal range, based on BMI >25.0 kg/m^2. After that, bivariate analysis of nutritional status is divided into two categories: normal and abnormal. 113 respondents (43.4%) have normal BMI. 147 respondents (56.6%) have abnormal BMI. This can be seen in Table 2.

Based on the analysis result of the relationship between respondents' psychological response and nutritional status that can be seen in table 3, 100 respondents (74.6%) with diabetes distress show abnormal nutritional status. Statistical test result shows that there is a between between psychological response and nutritional status (*p value* <0,000, α: 0.05). Based on OR value, it can be concluded that respondents with diabetes distress have 4.944 times higher risk of having abnormal nutritional status

compared to respondents with no diabetes distress (95% CI: 2.908 ;8.406).

Discussion

The result of this study reveals that 51.5% respondents are >60 years old. This is supported by a research that stated 64% patients diagnosed with diabetes mellitus were >55 years old (24). A research on 11,358 people showed 446 people had diabetes mellitus and 302 respondents were >50 years old. This indicates that DM, in the study, was caused by aging process. Aging process will affect compensation ability of β cell function in pancreas and insulin resistance. Decreasing mitochondria function also contributes in insulin resistance (25).

Most respondents of this research are female (52.3%) and 47.7% respondents are male. This is supported by a research on 3,506 DM patients where as many as 1,811 respondents (51.66%) were female. Similar finding has also been stated in a research concerning risk factor related to type 2 diabetes mellitus where 61.9% of the respondents were female. Apart from obesity factor which more commonly happens to women, there is also hormonal effect affecting metabolism in women due to aging process. The decreasing estrogens and increasing androgen, including testosterone and dehydroepiandrosterone, result in the increase of insulin resistance and glucose level (26).

The highest number of the comorbidity is hypertension, found in 55% respondents. This is consistent with the result of a systemic review on 2,688 research where there was a high prevalence of hypertension in diabetes patients, as much as >50%-75%, in the world. A research in German also showed hypertension prevalence up to 83% in T2DM patients

(24). Hypertension is one of cardiovascular diseases that can happen to a patient with diabetes. The risk of cardiovascular disease in diabetes patients is caused by various complex factors that lead to a change in medium-sized and large-sized blood vessels and coronary artery disease, cerebrovascular as well as peripheral vascular disease (25).

The result of this research shows that 58.5% respondents use oral anti-diabetic medication, 31.2% respondents use injection, and 10.4% of them use the combination of oral medication and injection. Anti-diabetic medication and insulin are examples of several ways used to maintain normal amount of blood sugar level as well as to prevent and to minimize diabetes complications. The metanalysis result of random control trial on 1,632 research articles and 18,599 samples proved the use of oral medication significantly decreased the risk of hypoglycemia compared to insulin use (27).

The result of this research shows only 53.1% respondents have sufficient food intake and follow Perkeni standards (28). This is in line with (15) that stated even when diabetes patients were educated in food planning, more than 50% patients did not follow the recommendations. The recommended healthy diet for T2DM patients only cuts daily energy intake in accordance to the minimal standard of daily calorie intake by reducing food high in calorie such as sweet or fatty food and adding food intake that is low in calorie such as vegetables, mushrooms, etc.

Most of the respondents, 51.5% of the total sample in this research, have psychological response marked with diabetes distress. The same thing was shown in a research on 509 T2DM patients (29). More than 25% patients experienced psychological response marked by diabetes distress and prevalence concerning diabetes around 18% - 35% (30).

Diabetes is a disease that is commonly followed by emotional distress due to a change in lifestyle such as diet, medicine, and activities. The psychological response is usually emotional and behavior change. The psychological problem can include distress, depression, or anxiety that can affect someone's ability in treating diabetes.

The nutritional status of 56.5% respondents in this research is abnormal. This can be seen as 50.8% respondents' nutritional status is more than the normal range with BMI >25.0 kg/m^2. 5.8% respondents' nutritional status is less than the normal range with BMI <18.5 kg/m^2. This result is in line with a research on 1,956 DM patients which stated that BMI $>25,0$ was more common in DM patients than BMI $<18,5$ kg/m^2 or BMI 18,5-25,0 kg/m^2. Overweight nutritional status is caused by excessive nutrient intake in long term which results in excessive fat. Fatty acid in free form circulates in blood vessels around the body, causing oxidative stress, that is, lipotoxicity. Lipotoxicity can increase hypertriglyceridemia tendency and decrease insulin secretion from β cell of pancreas.

In this research, 5.8 % respondents have nutritional status that is less than the normal range with BMI <18.5 kg/m^2. This condition does not occur often, is unknown and not treated. However, it is assumed that malnutrition affects more than three millions DM patients in England. Undernutrition can be caused by disturbance in food intake or increasing metabolism followed by the increasing

needs of basal energy or disturbance in nutrition assimilation process which leads to the imbalance between nutrition intake and energy needs. The disturbance can involve the lack of the main components of nutrition (calorie or protein) and additional components of nutrition (micronutrient) as well as decreasing organ mass. Decreasing mass can result in decreased organ function. If it happens in a long term, it can cause complications or even death.

The result of statistical test shows that there is a significant between between psychological response and nutritional status in T2DM patients with *p value* 0.000, α 0.05. From 147 respondents with abnormal nutritional status, 74.6% of them have diabetes distress. In line with this research is the result of a study on 509 T2DM patients (29). The research stated that diabetes distress as a psychological response had a significant between to body mass index, HbA1c, and triglyceride level. This was supported by research involving 267 T2DM patients (31). The study affirmed that body mass index was significantly betweened to psychological response with *p value* < 0.01 where the more depression and diabetes distress were experienced by the respondents, the less normal their body mass index: either more or less than the normal range.

In this research, most respondents show anxiety or concern regarding diabetes. It can be seen from their response in data collection by asking the researcher questions concerning their diabetes mellitus. Several respondents express their concern with the complications and the condition they have to face due to lifestyle change.

Nevertheless, the result of this study also reveals 48.5% respondents do not show diabetes distress. They state that they do not think much of this disease and accept the fact that they have diabetes. They are ready to live with diabetes. They also mention that their families help them in diet control, reminding them to take the medicine or injection, and blood sugar control. This is affirmed in the process of data collection, when the respondents are accompanied by their spouses or children when they discuss their health.

LIMITATIONS

One of the limitations of the data collection process is the sampling technique used. The researcher took data from three types of hospitals in Jakarta and used a consecutive sampling technique, which is expected to be able to represent the sample in these three hospitals. However, during the research process, at one hospital, many patients could not be the subjects because they had become research subjects from the hospital research, and the authors were asked not to include these patients in the author's research so that the number of samples at this hospital was too small when compared to the other hospitals. It makes the number of samples between hospitals and other hospitals not balanced enough, so it is feared that the results of this study could be biased because they are not sufficiently representative of the population in these three hospitals.

ETHIC

This study pays attention to aspects of autonomy, benefit and informed consent. Researchers provide an explanation of the benefits and objectives of the study to the respondents. In addition, this research has passed the ethical test at the FIK-UI Research Ethics Committee and from each research location.

CONFLICT OF INTEREST

No conflict of interest was found in this study.

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CONCLUSION

Based on the result of this research, it can be concluded that there is a relationship between psychological response and nutritional status. Respondents with diabetes distress have 4.944 times higher risk of having abnormal nutritional status compared to those without diabetes distress.

In this case, nurses need to step up their care to understand more about the psychological needs of T2DM patients. One of the things they can do is organizing a regular meeting between nurses and DM patients in groups. This meeting can be conducted on the day patients come to the outpatient unit (once every four weeks). One or two nurse can host this meeting in the hope that they can assess patients' psychological needs and help improve their nutritional status. The result of this study can be the foundation for further research concerning psychological response and nutritional status of T2DM patients. Some of the possible research problems include the types of psychological response in patients and other problems involving nutritional status in T2DM patients.

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