Research Article

Predictors of Glycemic Control in Type II Diabetes Mellitus Patients

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Abstract. Diabetes mellitus is a chronic disease that can cause premature death. In addition, this disease is one of the leading causes of blindness, heart disease and kidney failure. Diabetes mellitus management consists of four main components: education, medical nutrition therapy, physical exercise, and pharmacological therapy to maintain the blood glucose levels within normal levels. This study aimed to determine the most influential factors related to blood glucose levels among the four components of diabetes management. This was quantitative research with a cross-sectional approach. Data were obtained from 179 adults with type II diabetes mellitus using a questionnaire and were analyzed using logistic regression. The results showed that the strongest predictor of glycemic control was knowledge about diabetes self-management. We therefore recommend that nurses and other medical teams improve the provision of health education and promotion about diabetes self-care management to patients, so that they can maintain their health.

Keywords: diabetes mellitus, self-management, glycemic control

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1. Introduction

Diabetes not only causes premature death worldwide, butalso become the leading cause of blindness, heart disease and kidney failure [1]. The International Diabetes Federation (IDF) estimates that there are 463 million people aged 20-79 years in the world suffering from Diabetes in 2019, or equivalent to a prevalence rate of 9.3% of the total population at the same age [2]. The results of Indonesian Basic Health Research or Riskesdas in 2018 shown that the prevalence of diabetes mellitus in Indonesia based on a doctor's diagnosis at age more than 15 years old is 2%. It means that there is an increase compared to the result in 2013 which shown that the prevalence number was 1.5%[1]. The highest prevalence of Diabetes Mellitus patient in Kupang City was at Oesapa Public HeathCenter as many as 5,765 patients and only 398 patients received health services according to standards or only around 6.9% [3] .

Most of patient with Diabetes Mellitus Type II had low glycemic control [4]. Poor glycemic controls could increase the possibility of life threatening complications, such as kidney failure [5], coronary heart disease and many others [6]. Patient needs to

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maintain their blood sugar level within normal range by obeying the diabetes mellitus management [6]. However, maintaining blood sugar levels within normal by adhering the diabetes mellitus management are difficult.

The Diabetes Mellitus management helps in terms of promoting adherence to self-care management of diabetes mellitus patients and it is important to prevent possible complications related to diabetes mellitus [2]. According to Indonesian Endocrinology Association or PERKENI, there are four components of diabetes management, such as education, medical nutrition therapy, physical and pharmacological therapy [6]. Health Education and support for diabetes self-care management on an ongoing basis is very important to prevent acute complications and reduce the risk of long-term complications. There is significant evidence supporting various interventions to improve health outcomes for people with diabetes [6].

National standards for health education and diabetes self-management support define Diabetes Self Management Education (DSME) as an ongoing collaborative process used to facilitate the development of the knowledge, skills, and abilities necessary for successful diabetes self-management. Diabetes Self-Management Education is an important element of care for all people with diabetes and is necessary to prevent or delay diabetes complications [7]. This study aims to determine the most dominant factor related to blood glucose levels among the four components of diabetes self management.

2. Method

2.1. Study Design and Participants

The study was a quantitative reseach with cross sectional approach. A Purposive sampling technique was used to ensure that the respondent met the inclusion criteria. The criteria included : (1) aged aged20-59 years old, (2) have diagnosed type 2 diabetes (for at least six months based on the medical records), (3) are willing to participate in this study, and (4) are able to read and write Bahasa Indonesia. The numbers of population were 179 taken as respondents. The number of respondents obtained from the result of formula using G-Power version 3.1.9.4 to calculate the sample size with asumsion OR 0,208, two tail(s) and 1- err prob 0.80 [2].The data were obtained at Oesapa Public Health Center which located in Kupang City since May to June 2021.

2.2. Operational Defenitions

Self – management consists of 4 item (knowledge towards diabetes self management, medical nutritional therapy, physical exercise, pharmacology therapy) while for blood sugar seen from the results of fasting blood sugar 2 hours after eating. The scale used is Likert scale.

2.3. Data Collection

The researcher applied for permission from Kupang City Health Office before carry out this research. After the permit was obtained, the researcher continued to conduct the research at the Community Health Center located in Kupang City area. The researcher gives the brief explanation to the respondent about the research and asks for approval to become a respondent before data collection. When doing data collection, there were 10 patients who refused to take part in the research because they were in rush. After the respondents signed the agreement to become respondents on the informed consent, they filled out the research questionnaire themselves.

2.4. Instrument

A questionnaire about the self care management adopted from Schmitt DSMQ (diabetes self care management questionnaire) [8] and it's divided into four group (glucose management, dietary control, physical activity, and health care use). The researcher change based on Indonesian Endocrinology Association or PERKENI [6]. The questionnaire contains 28 items, Each item is rated on a four-item Likert scale where 0 means no and 3 strongly agrees. all scores are converted to a 0-10 scale (raw score/maximum score *10)Higher scores indicate more effective self-care [8]. The questionnaire were self-administered and consist of four diabetes management components, such as education, medical nutrition therapy physical exercise and pharmacological therapy. A questionnaire completed in approximately thirty minutes. The data calculated in the form of descriptive statistics and analyzed by using the Likert Scale used to measure, the opinion and perception of the respondents.

A dry-run of questionnaire conducted. Ten respondents who were not included in the study answered the questionnaire about self-care management of patient with type 2 diabetes. The questionnaire were tested using content validity index item (CVI-I) with the result value 0.89. The content validation was done by nursing expertise. This study

used informed consent, anonymity and confidentialityas ethic consideration. It was also received approval permission from the Ethic Commission of Citra Bangsa University with number EC/NO.003/A/2021.

Logistic regression with method enter test was used to determine predictors of glycemic control among type 2 diabetes mellitus patient. Logistic regression analysis was carried out if the dependent variable was a categorical variable and to explain the effect of several independent variables on the dependent variable.

3. Results

A total of 179 respondents participated in this study. The result shown that the majority of respondents were women as many as 55.3%. Furthermore, 56.4% respondents were in age range 45 to 59 years old, The longest duration of having Type II Diabetes Mellitus were under five years as many as 68.2% of respondents. In terms of level of education, the majority of respondents were Senior High School graduates (31.3%). Most of the respondent were working as farmers (29.6%) and a housewives (28.5%). Table 1 shown the characteristic of the respondents.

In table 2, it can be seen that the strongest predictor of glycemic control was Knowledge towards diabetes self management (OR = 70,8;95%CI=24,6-203,6) follow by pharmacology therapy (OR = 7,6; 95% CI = 3,7-15,3).

4. Discussion

The majority of respondents' ages in this study were in the range of 45 – 59 years. The age group of 45 years and over is a group at high risk of developing DM [9]. A person's age has a close relationship with the risk of developing type II Diabetes Mellitus and also an increase in blood glucose levels. The older you get, the higher your risk of developing diabetes. Aging process causes anatomical, physiological and biochemical changes that have an impact on increasing insulin resistance. In addition, women who have reached this age range also enter menopause. thereby affecting the decrease in female hormones which during their youth helped the metabolism in the body [10].

The duration of respondents suffering from diabetes in this study was dominated by 56.4% in the range of under 5 years. The results of this study are the same as those conducted by Banggut et al 2021 [11], which stated that the majority of diabetic patients suffer from this disease in the range of 1 to 5 years. This relates to the patient's

TABLE 1: The Characteristic of Respondents (n=179)

Characteristics	Frequency	(%)
Gender		
Male	80	44,7
Female	99	55,3
Age Range		
45 – 59 Years Old	101	56,4
>60 Years Old	78	43,6
Disease Duration		
< 5 years	122	68,2
>5 tyears	57	31,8
Educational Level		
Elementary School	51	28,5
Junior High School	31	17,3
Senior High School	56	31,3
College Undergraduate	41	22,9
Profession		
Farmer	53	29,6
Government Officer	21	11,7
Private Sector Employee	23	12,8
Entrepreneur Sector	31	17,3
Housewive	51	28,5

TABLE 2: Predictor of Glycemic Control among Type II Diabetes Mellitus Patient

No	Variable	Exp (B)	95% CI	p-value
1	Knowledge towards diabetes self management	70,812	24,627; 203,613	0,000
2	Medical Nutritional Therapy	0,401	0,172;0,934	0,034
3	Physical Exercise	1,345	0,717;2,524	0,355
4	Pharmacology Therapy	7,616	3.782;15.335	0,000

diabetes management. The longer a patient lives with diabetes, the more the patient is accustomed to undergoing diabetes management [11].

Moreover, this study showed that the strongest predictor of glycemic control was Knowledge towards diabetes self management. Appropriate education and information can improve patient compliance undergoing a comprehensive treatment program, so that,thecontrol of blood glucose levels within normal range could be achieved. The better education and compliance could have influence for patient to absorb information related to their disease.Thus, Diabetes Mellitus patients able to relatively live normally if they know their condition and how to manage the disease [12].

The education provided in this study consist of an understanding of the importance of disease control, complications and risks that arise, the importance of drug intervention, blood glucose monitoring, how to overcome hypoglycemia, and how to use health facilities. Education could also support successful behavior, so that it helps control blood sugar individually. Blood sugar levels are an increase after eating and decrease in the morning after waking up [6]. In the blood, blood glucose levels always fluctuate depending on food intake. The highest levels are reached one hour after eating [6].

This study is in line with research conducted by researchers with the result that there is a relationship between education and blood glucose levels in patients with type 2 diabetes mellitus [13].

Providing education improve the patient's knowledge about a healthy lifestyle and their efforts to control blood glucose levels, while knowledge is a predisposing factor for a person's health behavior. Predisposing factors are factors that able to facilitate or predispose to behavior, such as the knowledge of a person or society about what to do, beliefs, beliefs, values, traditions and so on [14]. Nursing education is a form of independent nursing intervention to help patients, both individuals, groups, and communities in overcoming health problems through learning activities in which nurses act as someone who provides information to patients [15].

The provision of education also has an influence on the self-efficacy of Diabetes Mellitus patients. Self-efficacy is defined as the patient's belief in maintaining and improving his medical condition. A previous research show that there is an influence of DSME application based on emotional demonstration on self-efficacy patients with Diabetes Mellitus type II [16]. The majority of respondents in this study were patients who graduated from Senior High School, which was 31.3%. The results of this study are supported by previous research which also states that the majority of respondents' last education is at the high school level [17]. When a person takes higher education, the individual will more easily receive information and think more creatively to solve the problems they face [11]. This is supported by the statement that a lack of education can hinder the development of individual attitudes towards values and new things that are introduced to them [16].

5. Conclusion

Based on the results of the study, it was found that the strongest predictor of glycemic control was knowledge towards diabetes self-management. As the recommendation, nurses and other medical teams could improve the provision of health education and

promotion about diabetes self-care management to patients, thus they could be able to maintain their health.

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Conflict of Interest

The authors declare no conflict of interest associated with this manuscript.

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