SELF-MANAGEMENT DIET AND RANDOM PLASMA GLUCOSE CONTROL OF PATIENT WITH TYPE 2 DIABETES MELLITUS AT PUSKESMAS ALUN-ALUN GRESIK

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ABSTRACT

Introduction: Diabetes Mellitus (DM) is a non-communicable metabolic disease characterized by the pancreas not being able to produce insulin and a decrease in insulin receptor sensitivity. Epidemiological data show the prevalence of type 2 diabetes mellitus is high in Indonesia and is estimated to increase by more than 2.5 times in 2030 compared to 2020. Several factors play an important role in the development and management of diabetes cases, including the management of a good independent diet. People with DM who do not pay attention to their diet can trigger complications and disability.

Purpose: This study aims to determine the correlation between independent diet management and blood sugar control in patients with type 2 diabetes mellitus.

Method: This study used an observational analytic method with a cross-sectional design. The sampling technique was consecutive sampling. Self-management assessment of diet used the Self-Management Diabetic Diet Questionnaire (SMBDQ) which has been adjusted and tested for validity and reliability. Blood sugar is measured using a glucometer. Data processing was conducted using Kendall's tau C with a significance level of 95% ($\alpha=0.05$).

Result: There were 79 respondents. There was a correlation with a significance value (P= 0.002) with a low correlation ($\tau=0.255$) between independent diet management and current blood sugar control in patients with type 2 diabetes mellitus.

Conclusion: Independent diet management has a significant correlation with blood sugar control in patients with type 2 diabetes mellitus.

Keyword: Diabetes Mellitus, Independent Diet Management, Random Plasma Glucose, Self-Management Diabetic Diet Questionnaire

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INTRODUCTION

Type 2 Diabetes Mellitus (DM) is a type of non-communicable metabolic disease that is a serious problem for public health in Indonesia and in the world. Diabetes mellitus cases in 2020 were included in the 15 most cases and ranked third at Puskesmas Alun-Alun Gresik with a total of 3,130 cases [1,2].

Diabetes mellitus (DM) is characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both. There are many risk factors for DM, including the group that is overweight (BMI > 23 kg/m2) followed by other factors such as lack of physical activity, hypertension, dyslipidemia, history of cardiovascular disease, or age >45 years with other factors also accompanying it [3].

DM management starts with implementing a healthy lifestyle (medical nutrition therapy and physical activity) along with pharmacological interventions using Oral Anti-Diabetes (OAD) drugs and insulin injections. OAD drugs can be given as a single therapy or in combination to achieve therapeutic targets [4].

Diet is one of the main factors for the success of DM therapy. Diet patterns for people with diabetes include the right type, amount, and time of eating to achieve treatment goals. The problem faced is that people with diabetes tend to have uncontrolled blood sugar levels due to an unfavorable diet.

Diabetes Self-Management is an independent action for people with diabetes to manage the skills, knowledge, and abilities of people with diabetes to monitor disease control. This action consists of dietary regulation, physical exercise, medication, and self-monitoring of blood sugar and foot care. This indicates that the independent diet pattern is one of the benchmarks for the success of glycemic control.

Based on the above problems, this study is needed to measure independent diet management on blood sugar control of people with diabetes. Assessment of blood sugar control is known by examining the Random Plasma Glucose (RPG). This study intends to determine the correlation of independent diet management on blood sugar levels in people with type 2 DM in the working area of Puskesmas Alun-Alun Gresik.

METHOD

The research design used was an observational analytic study with a cross-sectional approach. This research was conducted by Puskesmas Alun - Alun Gresik who went to the general polyclinic and the elderly. Sampling in this study used a consecutive sampling method that fulfilled the inclusion and exclusion criteria (Appendix A). The sample size was determined by the correlation coefficient formula. The minimum number of samples was 60 respondents. This research was conducted on April 23-27th, 2022 from 08.00 to 12.00 following the schedule of Puskesmas Alun-Alun Gresik. The variables studied were independent diet management (independent variable) and Random Plasma Glucose (dependent variable). Data collection on patient characteristics was based on sex, length of time with diabetes mellitus, body mass index, age, and education level.

Data collection methods to assess dietary patterns were interviewing with the Self-Management Dietary Behaviors Questionnaire (SMDBQ) questionnaire and measurement of blood sugar levels using a glucometer. The SMDBQ questionnaire obtained from Primanda, et al 2011 (Appendix B) served to assess dietary patterns which contained 16 question components, such as 13 positive questions related to expected behavior, and 3 negative questions related to undesirable behavior, which was divided into 1 question recognizing the number of calorie needs, 7 healthy food selection questions, 5 meal planning questions, and 3 diet management questions. The assessment of each component was based on 4 Linkert scales (4 = routine; 3 = often; 2 = sometimes; 1 =

never). The exceptions for questions 5, 10, and 14 were the other way around (1 = routine; 2 = often; 3 = sometimes; 4 = never). The results of the SMBDQ were divided into 3 categories namely, SMDBQ < 32 = poor; 32-48 = sufficient, and >48 = good. [5] This questionnaire has been validated with a calculated r value of 0.544, an r table of 0.4821, and a reliability value (Cronbach's alpha 0.968) [6]

Measurement of RPG levels used a glucometer with a sensitivity of 83.5% and specificity of 97.5%. (7). RPG measurement results were divided into 2 categories: controlled (RPG < 180 mg/dL) and uncontrolled (RPG > 180 mg/dL). The data were analyzed by Kendall's tau C correlation test with a significance value of $P < 0.05$. This correlation test was carried out using the 2016 Statistical Package for the Social Science 23 (SPSS 23) application.

RESULTS

Based on research that has been conducted from April 23-27th 2022, it was found that 79 respondents with DM were assessed using the SMBDQ questionnaire interview and RPG examination. 44 out of 79 respondents had uncontrolled blood sugar, and the rest had controlled blood sugar.

Correlation of Independent Diet Management Assessment with Blood Sugar Control

Table 1 Correlation of Independent Diet Management with Blood Sugar Control

Independent Diet Management	Blood Sugar Control				Total		P Value	Correlation coefficient
	Uncontrolled		Controlled					
	n	%	n	%	n	%		
Poor	6	7,6%	1	1,3%	7	8,9%		
Sufficient	37	46,8%	27	34,2%	64	81%	0,002	0,255
Good	1	1,3%	7	8,9%	8	10,1%		
Total	7	55,7%	64	44,3%	79	100%		

Table 1 showed that the analysis of both variables with a significance value of p=0,002 (α=0,05) proved that there was a significant correlation between independent diet management and blood sugar control in the community of Puskesmas Alun-Alun Gresik. The correlation coefficient obtained was τ=0,255.

**Sample Distribution Based on Blood Sugar Control**

Graph 1 Distribution of Respondents Based on Blood Sugar Control
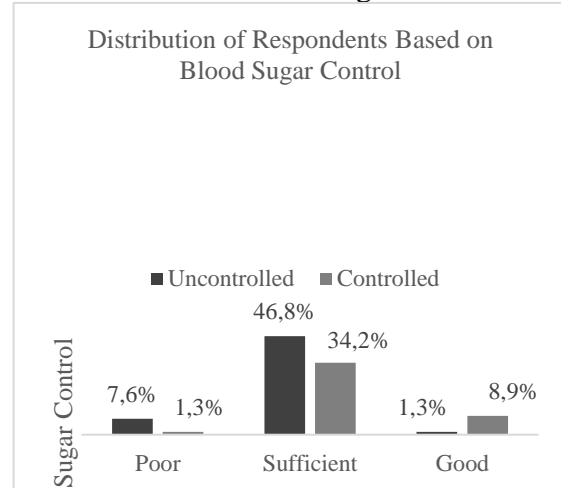
Graph 1 showed the blood sugar control of patients with type 2 diabetes mellitus. The results portrayed that the scoring independent diet management were 79 respondents who were studied at Puskesmas Alun-Alun Gresik. The largest percentage of blood sugar control was found in the uncontrolled group with a total of 51% of the total respondents.
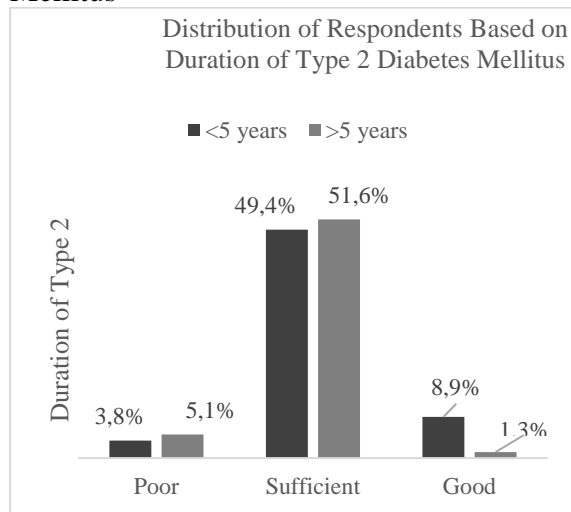
3.3 Sample Distribution Based on Sex

Graphic 2 Distribution of Respondents Based on Sex

Distribution of Respondents Based on Sex
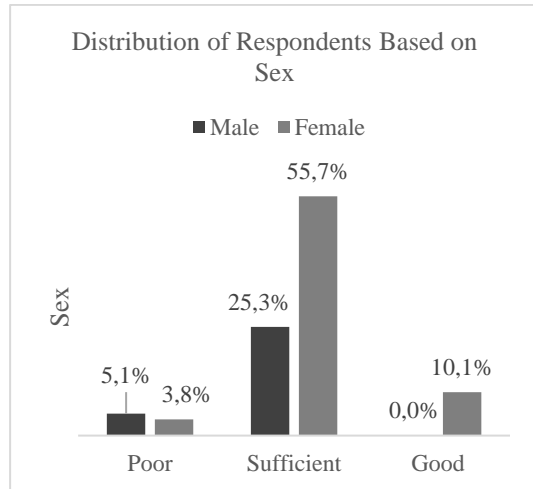
Based on Graph 2, the distribution of respondents showed female was 69.6% and male was 30.4%. The poor SMDBQ results were male (5.1%), sufficient results were female (55.7%), and good were mostly female (10.1%).

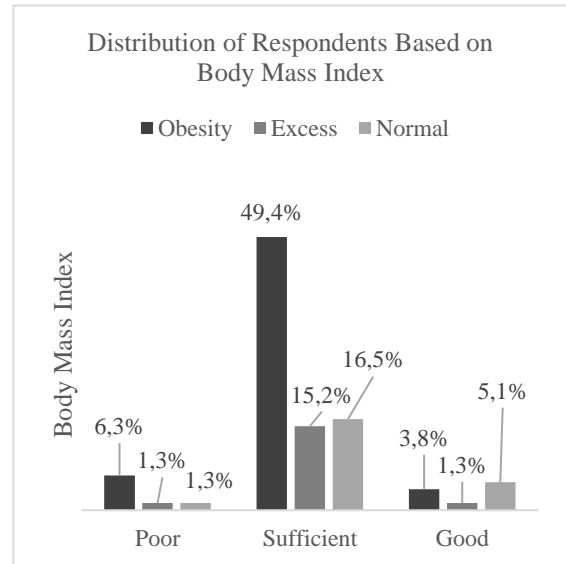**Sample Distribution Based on Duration of Type 2 Diabetes Mellitus**
Graphic 3 Distribution of Respondents Based on Duration of Type 2 Diabetes Mellitus

Distribution of Respondents Based on Duration of Type 2 Diabetes Mellitus

Based on graph 3, it was found that the distribution of respondents with type 2 DM <5 years was 62%, and >5 years was 38%. The poor SMDBQ results were people with DM >5 years (5.1%), the sufficient result was <5 years (49.4%), and the good were at < 5 years (8.9%).
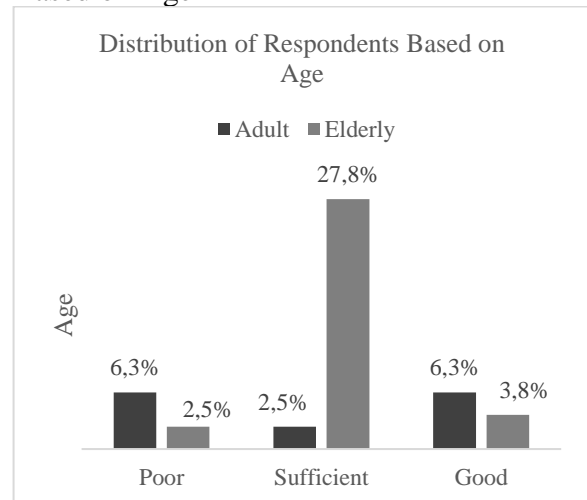
Sample Distribution Based on Body Mass Index
Graphic 4 Distribution of Respondents Based on Body Mass Index

Distribution of Respondents Based on Body Mass Index

Based on Graph 4, the distribution of respondents based on obesity BMI was 59.5%, normal BMI was 22.8%, and excess BMI was 17.7%. The poor SMDBQ results were in obese BMI (6.3%), sufficient in obese BMI (49.4%), and good in normal BMI (5.1%).

Sample Distribution Based on Age
Graphic 5 Distribution of Respondents Based on Age
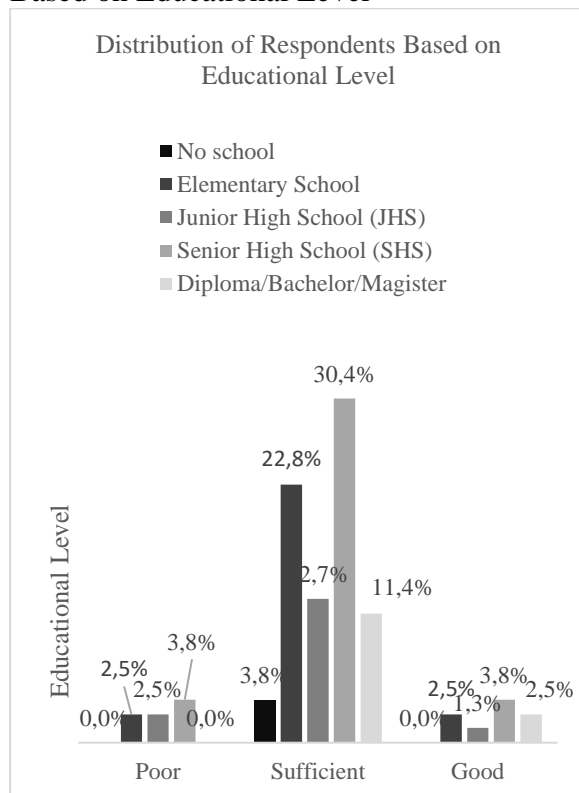
Distribution of Respondents Based on Age

Based on graph 5, the distribution of respondents with adult age was 65.8% and the elderly was 34.2%. The poor

SMDBQ results were in adults (6.3%), sufficient in the elderly (27.8%), and the good was in adults (6.3%).

Sample Distribution Based on Educational Level
Graphic 6 Distribution of Respondents Based on Educational Level

Based on graph 6, it was found that the distribution of respondents with the last education level not attending school was 3.8%, Elementary School was 27.8%, JHS was 16.5%, SHS was 38%, and Diploma/Bachelor/Magister was 13.5%. The poor SMDBQ results were at the JHS educational level (3.8%), sufficient at the SHS education level (30.4%), and good at the SHS education level (3.8%).

DISCUSSION
Type 2 Diabetes Mellitus (DM) is a metabolic disease that has become a global health problem. In 2019, it is estimated that around 28.7 million people are diagnosed with diabetes mellitus for all ages. The patient's blood sugar needs to be controlled to avoid diabetes complications. Independent diet patterns have an important role in patient glycemic control and they must be aware of choosing their food menu. Assessment of blood sugar control can be seen from the examination of blood sugar levels, one of which is the examination of Random Plasma Glucose (RPG). [1,7,8]
This study uses the SMBDQ questionnaire to assess the patient's independent diet pattern and the RPG examination to see blood sugar control.

Analysis results from statistical analysis using Kendall's Tau C showed significant results (P 0.003). The results of this analysis explained that there was a significant correlation between the independent diet pattern and the control RPG of the research subjects. Thus, the RPG examination can still be used to reflect the daily diet pattern of diabetes mellitus patients.

Analytical results obtained a correlation coefficient ($\tau = 0.255$) using Kendal's Tau C test. These results indicated a correlation between independent diet patterns and blood sugar control while having a weak correlation strength. The distribution of subjects with controlled sugar levels (≤ 180 mg/dL) and uncontrolled sugar levels (>180 mg/dL) on an adequate dietary pattern assessment was 27 (34.2%) controlled respondents and 37 (46.8%) respondents uncontrolled.

According to the number of respondents who were assessed, the percentage of patients who were controlled with those who were uncontrolled did not differ much. According to Otieno et al, randomized blood sugar examination has a sensitivity of 96% and a specificity of 59.8% for good blood sugar control compared with an HbA1C < 7.0% as a reference standard for good glycemic control. [9] However, Random Plasma Glucose should also be supported by other blood sugar tests, such as Fasting Plasma Glucose (FGP) and 2-hour Post Prandial

Glucose (GD2PP) which have higher specificity for assessing independent diet patterns for people with diabetes mellitus. [10,11] In addition, Random Plasma Glucose test results can be influenced by several factors. Factors that can affect the outcome of RPG such as the use of Oral Anti-Diabetes (OAD) drugs and steroids, diet and fasting patterns, psychological factors, and other underlying diseases. [3,12–14]

Based on graph 3.3 of the distribution of respondents based on sex with the SMDBQ questionnaire assessment, it was found that there were more respondents in women than men, while the highest SMDBQ value was the sufficient value obtained for the female sex, namely 44 people (55.6%). This is in line with research conducted by Elizabeth et al, 2013 which stated that men feel less knowledgeable about a healthy diet than women. In addition, studies have shown that women are more likely to share diabetes-related information with their peers than men. [15]

Based on graph 3.4, it was found that patients with diabetes mellitus for less than 5 years had better independent diet management than patients with diabetes mellitus for more than 5 years. The results obtained in this study were different from one of the previous studies. Patients who have suffered from diabetes for more than 5 years have better knowledge and experience in managing their diet. Thus, they are more obedient to the recommended diet. However, other studies argue that patients who have had diabetes mellitus for a longer time have poorer levels of dietary control because uncontrolled blood sugar levels are not only caused by depression which affects the production of stress hormones thereby increasing blood sugar levels, but also a person's level of compliance (saturation) in following the recommended independent diet. [16,17]

Based on graph 3.5, the distribution of respondents according to Body Mass Index by evaluating the SMDBQ questionnaire found that the poor SMDBQ scores were in the 'obese' BMI group. However, the SMDBQ group was also quite abundant in the obese BMI group. This is to a study by Hausman et al, which explained that the obese and overweight BMI groups reported having adequate or poor dietary patterns. It was because this group had poor dietary management in terms of frequency, amount, and type of food consumed (more protein and protein consumption) compared to the normal BMI group.

Based on graph 3.6, the distribution of respondents based on age with the SMDBQ questionnaire assessment, it was found that there were more respondents in the adult age than the elderly, while the highest SMDBQ value was the sufficient SMDBQ value with the highest percentage obtained in the adult age group, namely 2 people (53.15%). This is in line with research conducted by Khasanah, 2016 which stated that younger DM sufferers have a sufficient understanding of diabetes self-management and also the perceived benefits of doing activities related to daily DM management. [18]. Based on the data obtained in graph 3.7, the highest percentage of patients with poor independent diet management was found in patients with a junior high school education level (15.38%) while the highest percentage for good independent diet management was found in patients with Diploma/Bachelor/Magister education levels (18.18%) if both were compared to the total respondents with equal education. A study stated that the level of education influenced the incidence of diabetes mellitus. People with higher education are considered to have more insight into the world of health. [19] Perception and interpretation of a message or information, especially in the health sector, obtained from the

surrounding area which is believed to be easier to accept and understand for people with higher levels of education.[20–22]

CONCLUSIONS

Based on the results of the Correlation of Self Management Diet on Blood Sugar Levels for People with Type 2 Diabetes Mellitus in the work area of Puskesmas Alun-Alun Gresik which was carried out on April 23 – 27th 2022 with a total of 79 respondents, can be concluded that there is a significant relationship between independent diet management and control blood sugar in Puskesmas Alun-Alun Gresik with a low correlation strength. Therefore, it is necessary to check Fasting Plasma Glucose, 2-hour Post Prandial Glucose, and HbA1C to assess the whole independent diet pattern.

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