

Article

RELATIONSHIP BETWEEN EARLY DETECTION OF SIGNS AND SYMPTOMS OF HYPOGLYCEMIA WITH HYPOGLYCEMIA PREVENTION BEHAVIOR IN PATIENTS WITH DIABETES MELLITUS TYPE II AT YOSOWILANGUN COMMUNITY HEALTH CENTER

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A B S T R A C T

Diabetes mellitus is a metabolic disorder characterized by high blood sugar levels associated with abnormal carbohydrate, fat, and protein metabolism caused by decreased insulin secretion or decreased insulin sensitivity effectively. One of the acute complications in patients with Diabetes Mellitus (DM) 2 is hypoglycemia. Hypoglycemia is a blood glucose level ≤ 70 mg / dl (3.9 mmol / L). The purpose of this study was to determine the correlation between early detection of signs and symptoms of hypoglycemia and hypoglycemia prevention behavior in patients with type II diabetes mellitus at the Yosowilangun Health Center. This study design was descriptive analytical using a cross-sectional method. All patients with type II diabetes mellitus at the Yosowilangun Health Center. This study used a purposive sampling technique. The Amount population is 50 patient. The research sample was 48 respondents. The instrument used for data collection using a questionnaire for early detection of signs and symptoms and prevention of hypoglycemia. Both instruments were categorized as good, sufficient, and lacking. The statistical test used Spearman-rank with a significance level of 0.05. The results of the study showed that early detection of signs and symptoms of hypoglycemia was sufficient (66.7%) and prevention of hypoglycemia was sufficient (44.8%). The results of data analysis using the Spearman-rank test showed that the p value was smaller than significant ($0.001 < 0.05$), so there was a correlation between early detection of signs and symptoms of hypoglycemia and prevention of hypoglycemia in Type 2 DM patients at the Yosowilangun Health Center. The results of this study can be concluded that Type 2 DM respondents with a history of hypoglycemia can prevent hypoglycemia through knowledge of the signs and symptoms of hypoglycemia, so that they can minimize recurrent hypoglycemia. This can be recommended for health services that early detection of the disease as a guideline in treating Type 2 DM patients with hypoglycemia

I. INTRODUCTION

Diabetes mellitus (DM) is one of the global health threats and has been known as the "Mother of Disease", namely the parent or mother of comorbid diseases such as hypertension, obesity, coronary heart disease, or abnormal blood fat levels (Perkeni, 2021). There are two categories of DM, namely type 1 DM and type 2 DM. Type 2 DM is also called non-insulin dependent where insulin works less effectively. Type 2 DM cannot be cured, but can be controlled by controlling blood glucose. Type 2 DM is 90% of all categories of diabetes mellitus. High blood sugar levels occur due to insulin resistance, which is a condition of cells when the body cannot use the insulin hormone properly (Milita et al., 2021). The International Diabetes Federation in 2022 reported that 537 million adults (20-79 years) were living with diabetes worldwide. This number is expected to increase to 643 million (1 in 9 adults) in 2030 and 784 million (1 in 8 adults) in 2045. Diabetes mellitus caused 6.7 million deaths in 2021. An estimated 44% of adults living with diabetes (240 million people) are undiagnosed. 541 million adults worldwide, or 1 in 10, have impaired glucose tolerance, putting them at high risk for developing type 2 diabetes (IDF, 2021). The Ministry of Health of the Republic of Indonesia reported that the number of people with diabetes mellitus in 2021 was 19.47 million (Kemenkes RI, 2022). The East Java Provincial Health Office reported that the number of people with diabetes mellitus in East Java Province in 2021 reached 929,535 cases. Of that number, it is estimated that 867,257 sufferers (93.3%) have been diagnosed and received health services (East Java Health Office, 2022). According to the health profile of Lumajang Regency in 2021, the percentage of health services for DM sufferers in 2021 was 112.5% or 24,462 people from the estimated DM sufferers

(21,751 people). While in 2022, the percentage of health services for DM sufferers in 2022 reached 100% or 21,877 people from the estimated DM sufferers (21,846 people). In these results, there was a tendency to decrease from 2021 as many as 24,462 people to 21,877 people in 2022 (Lumajang Regency Health Office, 2022). The results of interviews conducted with 10 diabetes mellitus patients registered in the Yosowilangun Health Center environment, all said that they often ignore their health by not meeting the body's nutritional needs, exercising and not controlling their health status. This is what causes blood sugar levels in type 2 diabetes mellitus patients to be difficult to do.

One of the acute complications in patients with Diabetes Mellitus (DM) 2 is hypoglycemia. Hypoglycemia is a blood glucose level ≤ 70 mg / dl (3.9 mmol / L), this value is set by the American Diabetes Association as a blood glucose alert category. Hypoglycemia is the most common side effect of the use of insulin and sulfonylureas in DM 2 therapy, related to the mechanism of action of the drug, which is to prevent an increase in blood glucose rather than lowering glucose concentrations. Metformin, pioglitazone, DPP-4 inhibitors, acarbose, SLGT-2 inhibitors and GLP-1 analogs prescribed without insulin or insulin secretagogues (sulphonylureas / glinides) rarely cause hypoglycemia. Hypoglycemia is found to be a major obstacle in achieving long-term satisfaction of glycemic control and is a feared complication of DM therapy (Rusdi, 2020). According to the process of hypoglycemia, insulin resistance occurs due to decreased insulin activity in muscles, fat and liver. So that the pancreas will release more insulin. When the beta cells that secrete insulin in the pancreas are disrupted (dysfunction), there is an inadequate production of insulin, resulting in insulin resistance.

When insulin resistance occurs, there will be an increase in blood sugar levels (hyperglycemia). (Nurhayati & Sari, 2020). The high incidence and impact of hypoglycemia are closely related to the good or bad behavior of diabetes sufferers in managing their disease, especially the behavior/ability to detect hypoglycemia and this behavior must be possessed by every sufferer. Behavior in controlling health plays a very important role in the health status of diabetes patients. (Budiawan et al., 2020). Identification of factors related to the occurrence of hypoglycemia is important to determine the risk factors for hypoglycemia, so that it can be used as a basis for preventing severe hypoglycemia and recurrent hypoglycemia. The factors that play an important role in a person's behavior in controlling diabetes as an effort to detect early increases or decreases in blood sugar include level of knowledge, age, lifestyle, and attitude or behavior. The early symptoms of hypoglycemia are important for Type 2 DM patients to know, accompanied by initial complaints conveyed by Type 2 DM sufferers such as cold sweats, trembling hands and dizziness. Failure to recognize early symptoms of hypoglycemia is a dominant factor that risks worsening hypoglycemia (Budiawan et al., 2020). Based on research conducted by Risma, et al. 2021, it was explained that there was a relationship between the length of time suffering from diabetes mellitus and the behavior of detecting hypoglycemic episodes in type 2 diabetes mellitus patients in Kedundung Village, Magersari District, Mojokerto City. Respondents who had diabetes mellitus for > 6 years tended to have positive behavior because they were more experienced, understood the ins and outs of their disease, so that respondents had more experience living with diabetes than respondents who were < 6 years (Pigawati et al., 2021).

II. METHODS

Research design or design is something that is very important to review in research. Research design is a research strategy in identifying problems before the final planning of data collection and defining the structure implemented (Nursalam, 2020)

This research design uses a descriptive analytical research design using the cross-sectional method. The cross-sectional method is a type of research that emphasizes the time of measurement/observation of independent and dependent variable data only once at one time (Nursalam, 2017). Cross-sectional is conducted to develop and explain the relationship between early detection and Hypoglycemia prevention behavior.

III. RESULT

This chapter describes the results of a study conducted in Yosowilangun District, Lumajang Regency from July 31 to August 15, 2024 with 48 respondents. The results of the study are presented in two parts, namely general data and specific data. General data consists of respondent characteristics based on gender, age, education, occupation, weight, blood pressure, random blood sugar, and duration of type 2 diabetes mellitus. At the Yosowilangun Health Center, there is a prolanis program (chronic disease management program) which is held once a month so that the data collected is valid and residents routinely attend these activities to receive information and control individual health status.

A. Data Analysis

1. General Characteristics

1) General Data

a. Respondent Characteristics Based on Gender at Yosowilangun Health Center 31 July – 15 August 2024

Table 1 Respondent Characteristics Based on Gender at Yosowilangun Health Center 31 July – 15 August 2024

No.	Gender	Frequency	Percentage (%)
1.	Male	14	29,2
2.	Female	34	70,8
	Amount	48	100

From table 1, it can be seen that the majority of respondents were female, as many as 34 with a percentage of 70.8%, while the fewest respondents, as many as 14 with 29.2%, were male.

b. Respondent Characteristics Based on Age at Yosowilangun Health Center 31 July – 15 August 2024.

Table 2 Respondent Characteristics Based on Age at the Health Center 31 July – 15 August 2024

No.	Age	Frequency	Percentage (%)
1	45 – 55 years old	8	16,7
2	56 – 65 years old	19	39,6
3.	66 – 75 years old	21	43,8
	Amount	48	100

Based on table 2, it shows that most respondents are aged between 66-75 years, amounting to 21 respondents with a percentage of 43.8%. The fewest respondents with a Amount of 16.7% are aged between 45-55 years.

c. Respondent Characteristics Based on Education of Type 2 Diabetes Mellitus Patients at Yosowilangun Health Center July 31 – August 15, 2024

Table 3 Characteristics of Patient Education at Yosowilangun Health Center July 31 – August 15, 2024

No.	Education	Frequency	Percentage (%)
1.	No School	21	43.8
2.	Elementary School	21	43.8
3.	JHS	4	8,3
4.	SHS	2	4,2
	Amount	48	100

From the data in table 3, it shows that the respondents have the same number, namely not pursuing education and graduating from elementary school as many as 21 respondents with a percentage of 43.8%. The respondents who have the least number are high school graduates with a Amount of 4.2%.

d. Respondent Characteristics Based on Occupation of Type 2 Diabetes Mellitus Patients at Yosowilangun Health Center July 31 – August 15, 2024

Table 4 Characteristics of Patient Occupation at Yosowilangun Health Center July 31 – August 15, 2024

No.	Occupation	Frequency	Percentage (%)
1.	Housewife	27	56,3
2.	Self-Employed	19	39,6
3.	Private Employee	2	4,2
	Amount	48	100

Judging from the data in table 5.4, it shows that most respondents work as housewives, Amounting 27 respondents and a percentage of 56.3%. Respondents who have the least frequency are working as private employees, Amounting 4.2%.

e. Respondent Characteristics Based on Body Weight of Type 2 Diabetes Mellitus Patients at Yosowilangun Health Center July 31 – August 15, 2024

Table 5 Characteristics of Body Weight of Patients at Yosowilangun Health Center July 31 – August 15, 2024

No.	Patient Weight	Frequency	Percentage (%)
1.	45 kg – 55 kg	27	56,3
2.	56 kg – 65 kg	17	35,4
3.	66 kg – 75 kg	4	8,3
	Amount	48	100

Based on the data in table 5, it shows that most respondents weigh 45 kg - 55 kg, as many as 27 respondents with a percentage of 56.3%. The frequency of at least weighing 66 kg - 75 kg is 8.3%.

f. Respondent Characteristics Based on Blood Pressure of Type 2 Diabetes Mellitus Patients at Yosowilangun Health Center July 31 – August 15, 2024

Table 6 Characteristics of Blood Pressure of Patients at Yosowilangun Health Center July 31 – August 15, 2024

No.	Patient Pressure	Blood Pressure	Frequency	Percentage (%)
1.	100/60 mmHg – 150/90 mmHg		34	70,8
2.	160/90 mmHg – 200/100 mmHg		14	29,2
	Amount		48	100

Based on the data in table 6, it shows that most respondents have blood pressure of 100/60 mmHg – 150/90 mmHg, amounting to 34 respondents with a percentage of 70.8%. The least respondents have blood pressure ranging from 160/90 mmHg – 200/100 mmHg amounting to 29.2%.

g. Respondent Characteristics Based on Random Blood Sugar of Type 2 Diabetes Mellitus Patients at Yosowilangun Health Center July 31 – August 15, 2024

Table 7 Characteristics of Random Blood Sugar of Patients at Yosowilangun Health Center July 31 – August 15, 2024

No.	Gula Darah Acak Pasien	Frequency	Percentage (%)
1.	100 mg/dL – 150 mg/dL	4	8,3
2.	151 mg/dL – 200 mg/dL	23	47,9
3.	201 mg/dL – 400 mg/dL	21	43,8
	Amount	48	100

Judging from table 5.7 above, it shows that most respondents have blood sugar in the range of 151 mg/dL – 200 mg/dL, amounting to 23 respondents with a percentage of 47.9%. The least number of respondents have random blood sugar ranging from 201 mg/dL – 400 mg/dL amounting to 43.8%.

h. Respondent Characteristics Based on Duration of Suffering from Type 2 Diabetes Mellitus at Yosowilangun Health Center July 31 – August 15, 2024

Table 5. 8 Characteristics of Duration of Suffering from Type 2 DM Patients at Yosowilangun Health Center July 31 – August 15, 2024

No.	Duration of DM Type 2	Frequency	Percentage (%)
1.	1 – 5 years old	8	16,7
2.	6 – 10 years old	31	64,6
3.	≥ 11 years old	9	18,8
	Amount	48	100

Based on the data in table 5.8 above, it explains that most respondents have a duration of suffering from Type 2 DM in the range of 6-10 years as many as 31 respondents with a percentage of 64.6%. The least number of respondents have a duration of suffering from DM ranging from 1-5 years with 16.7%.

2) Special Data

a. Identification of early detection of signs of symptoms of hypoglycemia in Type II DM patients

Table 9 Identification of Early Detection of Signs of Symptoms of Hypoglycemia in Type II DM Patients

No	Early Detection of Signs of Hypoglycemia Symptoms	Frequency	Percentage (%)
1.	Less	13	27.1
2.	Enough	32	66.7
3.	Good	3	6.3
	Amount	48	100

Based on the data in table 5.9, the category of patients who were able to detect early signs and symptoms of hypoglycemia was mostly sufficient, amounting to 32 respondents with a percentage of 66.7%.

b. Identification of hypoglycemia prevention behavior in Type II DM patients

Table 10 Identification of hypoglycemia prevention behavior in Type II DM patients

No	Hypoglycemia Prevention	Frequency	Percentage (%)
1.	Less	14	29.2
2.	Enough	22	45.8
3.	Good	12	25
	Amount	48	100

Based on the data in table 5.10 above, it shows that the category of patients who are able to have hypoglycemia prevention behavior is mostly sufficient, amounting to 22 respondents with a percentage of 45.8%.

2. Identifying the relationship between early detection of signs and symptoms of hypoglycemia and hypoglycemia prevention behavior in Type II Diabetes Mellitus patients at the Yosowilangun Health Center.

Table 11 Relationship between early detection of signs and symptoms of hypoglycemia and hypoglycemia prevention behavior in Type II Diabetes Mellitus patients at Yosowilangun Health Center 31 July – 15 August 2024

Variable	Hypoglycemia Prevention						Amount	P
	Good		Enough		Less			
Early detection	N	%	N	%	N	%	N	%
Good	3	0%	0	0%	0	0%	3	100%
Enough	9	28,1%	2	6,8%	1	3,1%	32	66,7%
Less	0	0%	0	0%	1	3,1%	13	27,1%
Amount	12	25%	2	4,2%	1	2,1%	48	100%

p value = 0,001

Based on table 11, it can be seen that early detection of signs and symptoms of hypoglycemia with hypoglycemia prevention shows that respondents who have good hypoglycemia prevention are 12 respondents. Meanwhile, respondents who have good early detection are 3 respondents.

The results of the Spearman rank statistical test obtained a probability value or p value of 0.001, lower than the significant standard p value of 0.05 or (p < α), H1 was accepted, which means that there is a relationship between early detection of signs and symptoms of hypoglycemia and prevention of hypoglycemia in Type 2 DM patients at the Yosowilangun Health Center.

IV. DISCUSSION

1. Data and Results Interpretation

This chapter will describe the discussion of the research results related to the relationship between early detection of signs of hypoglycemia symptoms and hypoglycemia prevention behavior in Type II DM patients. The things that will be discussed include the results of early detection of signs of hypoglycemia symptoms in Type II DM patients at the Yosowilangun Health Center, hypoglycemia prevention behavior and the relationship between early detection and hypoglycemia prevention behavior in Type II DM patients at the Yosowilangun Health Center.

1) Identifying Early Detection of Signs and Symptoms of Hypoglycemia in Type II DM Patients at Yosowilangun Health Center

The results of the study in table 5.9 show that most respondents carried out early detection of signs and symptoms of hypoglycemia in Type 2 DM patients or as many as 32 respondents (66.7%) namely with the characteristics of headache or dizziness, easily feeling hungry, restless, tingling feet, trembling when consuming little food, weakness, blurred vision, and tachycardia, several supporting factors such as gender, age of respondents, level of education, occupation, weight of respondents, blood pressure, random blood sugar, and length of suffering from Type 2 DM. This is in line with research conducted by Nugroho, et al 2016. Signs and symptoms of hypoglycemia are characterized by headache or dizziness, weakness, rapid pulse, and blurred vision. In hypoglycemia, decreased blood glucose levels can cause brain cells to not get fuel to work properly, which can cause headaches. Therefore, if blood sugar is too low, the first organ affected is the central nervous system, such as headaches due to changes in cerebral blood flow (Nugroho, et al. 2016). Another characteristic is that

patients easily feel hungry and restless. According to research conducted by Sutawardana, Yulia and Waluyo (2016), almost all hypoglycemic patients expressed the impact of hypoglycemia on physical weakness, including weakness, trembling, cold sweats, blurred vision and feeling unwell. The attacks experienced by participants were also often sudden (spontaneous) (Sutawardana et al., 2016). This occurs as a manifestation of the body's counter-regulatory response to hypoglycemia. According to Smeltzer et al, (2010) the main cause of physical weakness is the lack of glucose uptake by body cells. This is the impact of low insulin levels or insulin resistance conditions so that minimal or decreased insulin function in the body's circulatory system will cause cells to not get adequate glucose intake. If this condition is accompanied by a decrease in blood glucose levels below 60 mg/dl, it will result in low energy production, which then shows early symptoms such as physical weakness, fatigue, and drowsiness.

The initial mechanism that occurs in hypoglycemia is a sympathoadrenal-sympathetic neural reaction, namely the body will respond by secreting the hormones epinephrine, norepinephrine, glucagon, cortisol and growth hormone (Hillson, 2002) in (Dwiyatna et al., 2022). The release of the hormone epinephrine is what causes a response in the form of tachycardia, palpitations, tremors, and cold sweats. Epinephrine also plays a role in increasing gluconeogenesis in the kidneys, where in hypoglycemia it can increase glucose production by approximately 25% of the body's needs. Researchers assume based on the explanation above, that a decrease in glucose levels below <70 mg/dl will have an acute impact on brain function because the brain is very dependent on glucose and can only be obtained from blood circulation so that the symptoms experienced by respondents are

headaches. and so does the absorption of body cells decreases, until there is body weakness, trembling, restlessness and blurred vision.

2) Identifying hypoglycemia prevention behavior in Type II DM patients at the Yosowilangun Health Center

The results of the study in table 5.10 show that some respondents or 22 respondents with a percentage of 45.8% carried out hypoglycemia prevention, which is categorized when they can control the food they consume, are able to fulfill all the recommendations of health facilities recommended for diabetes care, take diabetes medication (oral medication or insulin injection) according to therapy, do physical activity regularly to achieve optimal blood sugar levels, and understand treatment if they experience signs and symptoms of hypoglycemia. The results of this study are in line with research conducted by Kurniasari, 2020. People with diabetes mellitus must be able to carry out optimal self-care, especially in controlling their blood glucose levels. This is intended so that people with diabetes mellitus avoid complications that can lead to death.

People with diabetes mellitus must have the ability to manage their health independently, including controlling their blood glucose levels. Of course, this also requires motivation and encouragement from both family and health workers. Increasing medication adherence in diabetes patients is one of the most important factors in controlling blood sugar levels in patients with type 2 diabetes mellitus, this is supported by research conducted by Juwita, Susilowati, Mauliku, & Nugrahaeni (2020) which revealed that medication adherence is the most dominant factor related to blood sugar levels. The results of the study were supported by research conducted by Zulfhi & Muflihatin (2020) which revealed that there was a relationship between medication

adherence and controlled blood sugar levels in patients with type II diabetes mellitus with hypoglycemia.

The researcher assumes based on the explanation of the theory above, that hypoglycemia must be prevented to minimize mortality and morbidity. Hypoglycemia prevention behavior is key in the long-term management of Type II DM. Therefore, patients with diabetes mellitus with hypoglycemia need to be given proper dietary arrangements to help control blood sugar levels. Dietary intervention aims to correct obesity, optimize blood glucose control and control dyslipidemia. Routinely taking medication and regular check-ups at service facilities are important steps to achieve maximum treatment.

3) Identifying the relationship between early detection of hypoglycemia symptoms and hypoglycemia prevention behavior in Type II Diabetes Mellitus patients at the Yosowilangun Health Center.

The results of this study indicate that the Spearman rank statistical test that has been carried out with a p value of 0.001 is lower than the α value (0.005) or the known significance value or Sig (2-tailed) of 0.001, because the Sig value (2-tailed) $0.001 <$ is smaller than 0.005. This can be interpreted that H_0 is rejected and H_1 is accepted, namely that there is a significant relationship between early detection of hypoglycemia symptoms and hypoglycemia prevention behavior in Type 2 DM patients at the Yosowilangun Health Center. From the SPSS output, a correlation coefficient figure of 0.481 was also obtained. This means that the level of strength of the relationship (correlation) between the variables of early detection of signs and symptoms of hypoglycemia and prevention of hypoglycemia is 0.481 or sufficient correlation. The correlation coefficient figure in the SPSS results is positive, namely 0.481. So that the relationship between the two variables is

unidirectional (type of unidirectional relationship), thus it can be interpreted that the more early detection of signs and symptoms of hypoglycemia is improved, the prevention of hypoglycemia will also increase.

This is in line with Nurhayati, 2020 who explained that there is a significant positive relationship between the level of knowledge of signs and symptoms of hypoglycemia and the ability to detect hypoglycemia in Type 2 DM patients. Individuals who have diabetes mellitus for longer are likely to be exposed to more information from health workers while they are controlling their disease.

Diabetes mellitus (DM) is a metabolic disorder characterized by increased blood glucose due to decreased insulin secretion by pancreatic beta cells and/or insulin disorders/resistance. The main risks that are usually found in every patient diagnosed with DM include hypoglycemia. Hypoglycemia is a decrease in serum glucose concentration with or without signs and symptoms of an autoimmune system.

According to (Setyohadi, 2012) the normal glucose concentration in the blood is 70-110 mg/dl. A decrease in the amount of glucose in the blood will trigger a response in the body, where when the body experiences a decrease in blood sugar levels it will trigger a decrease in insulin concentration physiologically, and will make the body lose consciousness. If the amount of sugar supplied by the blood decreases, it will certainly affect the function of the brain. When the brain loses the glucose supply it needs, the body will respond and will continue to experience a decrease in consciousness. The brain's dependence on every minute of glucose supply through circulation is caused by the brain's inability to meet the level of glucose reserves as glycogen in the brain. In addition, the brain cannot mix glucose and can only store glucose reserves in the form of glycogen but in

small amounts. Therefore, normal brain function will depend heavily on the concentration of glucose intake and circulation.

The symptoms and signs of hypoglycemia are not specific between individuals. Hypoglycemia can be confirmed by the presence of Whipple's Triad. Symptoms of hypoglycemia are categorized as neuroglycopenia, which are symptoms that are directly related to the brain when there is a lack of blood glucose. The second symptom of hypoglycemia is autonomic, which is a symptom that occurs as a result of activation of the sympatho-adrenal system so that there is a change in physiological perception. The concept of signs and symptoms of hypoglycemia has a significant relationship with the patient's knowledge of hypoglycemia prevention, in line with the Perkeni book, 2021, which explains the steps to avoid hypoglycemia, namely controlling the food consumed, fulfilling all doctor's recommendations recommended for diabetes treatment, taking diabetes medication (oral medication or insulin injection) according to therapy, doing regular physical activity to achieve optimal blood sugar levels, and understanding treatment if you experience signs and symptoms of hypoglycemia. Patients are also provided with an understanding of the signs and symptoms of hypoglycemia. The researcher assumes based on the theory above, that the results of this study indicate that there is a relationship between early detection of hypoglycemia and hypoglycemia prevention behavior in Type II DM patients. This is because preventing hypoglycemia requires a structured approach from patients and their families, so that both parties are able to recognize the symptoms of hypoglycemia and can deal with hypoglycemia episodes appropriately, either with oral glucose or glucagon. Therefore, knowledge of the signs and

symptoms of hypoglycemia, both in terms of prevention, therapy and monitoring, must be considered if you already have a history of hypoglycemia. Signs and symptoms of hypoglycemia are important to know for Type 2 DM patients and patients who have a history of hypoglycemia. Detecting signs and symptoms of hypoglycemia will make it easier to prevent hypoglycemia.

2. Research Limitations

In every study, limitations are certainly found, especially in the data collection process. The limitations experienced by researchers are

- a. Researchers cannot monitor the daily lifestyle at home of patients so that prevention of hypoglycemia requires monitoring at home.
- b. Researchers need to study more deeply and clarify factors that can be related and influence the activities of self-management of diabetes with patient knowledge.
- c. Researchers believe that the role of the family influences increasing the enthusiasm of patients, so researchers cannot explain in detail to the family regarding signs and symptoms, complications, etc.

3) Implications for Services, Education, and Health

Based on the results of the study, there are several implications that can be made for improvements in the field of nursing, especially:

a. Nursing Services

It is hoped that the results of this study will have an impact on efforts to improve health services by medical personnel, especially nurses when cases of DM patients with a history of hypoglycemia occur, so that education about the signs and symptoms and prevention of hypoglycemia can be known as early as possible.

b. Education

It is hoped that this study will be able to raise the issue of hypoglycemia as a disease that is not considered trivial and in terms of scientific research, further researchers can develop hypoglycemia.

c. Health

It is hoped that the results of this study can be used as study material on improving health service programs by implementing chronic disease management programs routinely.

V. CONCLUSION

1. Most respondents 66.7% or 32 respondents carried out early detection of signs and symptoms of Type 2 DM hypoglycemia
2. Almost half of the respondents 45.8% or 22 respondents carried out prevention of Type 2 DM hypoglycemia
3. There is a significant relationship between early detection of signs and symptoms of Type 2 DM hypoglycemia and hypoglycemia prevention behavior where the Spearman rank test results obtained a value ($p = 0.001 < \alpha 0.05$).

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