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Analysis of Knowledge Level with Low Carbohydrate Diet Compliance Level in Type II Diabetes Mellitus Patients

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ABSTRAK

Latar Belakang: Diabetes mellitus juga biasa disebut dengan *the silent killer* karena penyakit ini dapat mengenai semua organ tubuh dan menimbulkan berbagai macam keluhan. Salah satu komplikasi lain DM adalah luka sulit sembuh atau ulkus diabetikum yang rentang infeksi dan menyebabkan luka menjadi busuk atau gangreng. Kepatuhan dalam diet merupakan salah satu faktor untuk menstabilkan kadar gula dalam darah menjadi normal dan mencegah komplikasi.
Tujuan: Penelitian ini untuk mengetahui hubungan tingkat pengetahuan dan tingkat kepatuhan diet rendah karbohidrat pada pasien diabetes melitus type II di Puskesmas Lowa Kecamatan Bontosikuyu Kabupaten Kepulauan Selayar, Makassar Sulawesi Selatan.
Metode: Penelitian ini merupakan penelitian deskriptif analitik dengan pendekatan *cross sectional studi*. Sampel dalam penelitian adalah 118 responden dengan teknik penarikan sampel dengan menggunakan rumus slowvin. Pada penelitian ini analisis yang digunakan adalah analis *chi square.*
Hasil: Penelitian menunjukkan bahwa 1) Tingkat pengetahuan diet rendah karbohidrat pada pasien diabetes melitus type II di Puskesmas Lowa Kecamatan Bontosikuyu Kabupaten Kepulauan Selayar, Makassar Sulawesi Selatan dalam kategori baik dengan jumlah 51 responden (43.2%). 2) Tingkat kepatuhan diet rendah karbohidrat pada pasien diabetes melitus type II di Puskesmas Lowa Kecamatan Bontosikuyu Kabupaten Kepulauan Selayar, Makassar Sulawesi Selatan dalam kategori patuh dengan jumlah 94 responden (79.7%). 3). Ada hubungan tingkat pengetahuan dan tingkat kepatuhan diet rendah karbohidrat pada pasien diabetes melitus type II di Puskesmas Lowa Kecamatan Bontosikuyu Kabupaten Kepulauan Selayar Makassar Sulawesi Selatan dengan nilai *p-value* = 0,000 p<0,05.
Kesimpulan: terdapat hubungan tingkat pengetahuan dan tingkat kepatuhan diet rendah karbohidrat pada pasien diabetes melitus type II di Puskesmas Lowa Kecamatan Bontosikuyu Kabupaten Kepulauan Selayar Makassar Sulawesi Selatan.

Kata Kunci: Pengetahuan, Kepatuhan, Diet Karbohidrat, Diabetes Melitus

ABSTRACK

Background: *Diabetes mellitus, also commonly known as the silent killer, affects all organs of the body and causes various complaints. Another complication of diabetes mellitus is difficult-to-heal wounds or diabetic ulcers, which can become infected and lead to tissue decay or gangrene. Compliance with diet is one of the factors to stabilize blood sugar levels and prevent complications.*
Objective: *The purpose of this study was to determine the relationship between the level of knowledge and compliance with a low carbohydrate diet in Type II diabetes mellitus patients at Lowa Community Health Center, Bontosikuyu Sub-District, Kepulauan Selayar Regency, Makassar, South Sulawesi.*
Method: *This research was a descriptive analytic study with a cross-sectional study approach. The sample in this study consisted of 118 respondents selected using Slovin's formula. The analysis used in this study was chi-square analysis.*
Results: *The results showed that 1) The level of knowledge about low carbohydrate diet in Type II diabetes mellitus patients at Lowa Community Health Center, Bontosikuyu Sub-District, Kepulauan Selayar Regency, Makassar, South Sulawesi was categorized as good, with 51 respondents (43.2%). 2) The level of compliance with a low carbohydrate diet in Type II diabetes mellitus patients at Lowa Community Health Center, Bontosikuyu Sub-District, Kepulauan Selayar Regency, Makassar, South Sulawesi was categorized as compliant, with 94 respondents (79.7%). 3) There was a relationship between the level of knowledge and compliance with a low carbohydrate diet in Type II diabetes mellitus patients at Lowa Community Health Center, Bontosikuyu Sub-District, Kepulauan Selayar Regency, Makassar, South Sulawesi, with a p-value of 0.000 (p <0.05).*
Conclusion: *There is a relationship between the level of knowledge and compliance with a low carbohydrate diet in Type II diabetes mellitus patients at Lowa Community Health Center, Bontosikuyu Sub-District, Kepulauan Selayar Regency, Makassar, South Sulawesi.*

Keywords: Knowledge, Compliance, Carbohydrate Diet, Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus is a non-communicable disease which is the highest cause of death in the world. This disease also reduces sufferers' work productivity which results in reduced income and reduced quality of life of sufferers due to complications of the disease. Diabetes Mellitus is a disease that lasts a long time or is chronic and is characterized by blood sugar (glucose) levels that are high or above normal values (Marasabessy et al., 2022).

Diabetes mellitus is also commonly called the silent killer because this disease can affect all organs of the body and cause various kinds of complaints. And it causes complications, including vision problems, cataracts, heart and kidney disease, sexual inpotence, lung infections, blood vessel disorders, stroke and so on. One other complication of DM is wounds that are difficult to heal or diabetic ulcers which can become infected and cause the wound to become rotten or gangrenous (Novia et al., 2022).

High per capita income and changes in lifestyle, especially in big cities, have caused an increase in the prevalence of degenerative diseases, one of which is Diabetes Mellitus (DM). Diabetes is caused by several factors, namely unhealthy lifestyles such as unhealthy eating patterns, obesity and lack of exercise. Apart from that, 58% were taking the wrong dose of anti-hyperglycemia medication and 75% were not following the recommended diet.

According to World Health Organization data the number of diabetes sufferers increased from 108 million in 1980 to 422 million in 2014. Prevalence has increased faster in low- and middle-income countries than in high income countries. Between 2000 and 2016, there was a 5% increase in premature deaths from diabetes. In 2019, an estimated 1.5 million deaths were directly caused by diabetes. Another 2.2 million deaths were caused by high blood glucose in 2012 (WHO, 2021).

In 2019, according to the International Diabetes Federation (IDF), the global prevalence of diabetes in 2019 was estimated at 9.3% (463 million people), increasing to 10.2 (578 million) in 2030 and 10.9% (700 million) in 2045. The prevalence is higher in urban (10.8%) than rural areas (7.2%), and in high-income areas (10.4%) than in low-income countries (4.0%). One in two (50.1) people living with diabetes do not know that they have diabetes (IDF, 2019).

American Diabetes Association (ADA) prevalence in 2018, 34.2 million Americans, or 10.5% of the population, had DM. Nearly 1.6 million Americans had type 1 diabetes, including approximately 187,000 children and adolescents. Of the 34.2 million adults with diabetes, 26.8 million are diagnosed, and 7.3 are undiagnosed. New cases 1.5 million Americans are diagnosed with it every year. In 2015, 88 million Americans were diagnosed with diabetes each year. DM is the seventh leading cause of death in the United States where diabetes is listed as a cause of death with a total of 270,702 certificates (ADA, 2020).

The Ministry of Health of the Republic of Indonesia reports that the number of diabetes mellitus sufferers in 2021 will be 19.47 million people. Several risk factors for DM include general obesity at 10.3%, central obesity at 18.8%, IGT 10.2%, smoking habit at 23.7%, insufficient fruit and vegetable consumption at 93.6%, alcohol drinking habit at 4. 6%, and physical activity such as sports is less than 48.2% (Ministry of Health of the Republic of Indonesia, 2022).

The prevalence of Diabetes Mellitus in South Sulawesi is 1.6 percent. DM diagnosed by a doctor or based on symptoms was 3.4 percent. The highest prevalence of diabetes diagnosed by doctors is in Pinrang Regency (2.8%), Makassar City (2.5%), North Toraja Regency (2.3%) and Palopo City (2.1%). The prevalence of diabetes diagnosed by a doctor or based on symptoms is highest in Tana Toraja Regency (6.1%), Makassar City (5.3%), Luwu Regency (5.2%) and North Luwu Regency (4.0%). Based on non-communicable disease surveillance data from the P2PL

sector of the South Sulawesi Provincial Health Service in 2017, there were 27,470 new cases of diabetes mellitus, 66,780 old cases with 747 deaths (South Sulawesi Provincial Health Office, 2017).

Diabetes mellitus sufferers must routinely control blood sugar levels according to a specified schedule, so that blood sugar levels are known to prevent disorders and complications that may arise so that there is fast and appropriate treatment. Here it is necessary to provide knowledge about the benefits of diabetes mellitus client compliance in carrying out compliance control, so that it is hoped that there will be changes in the behavior of diabetes mellitus patients. Diabetes mellitus sufferers should adopt a balanced diet to adjust blood sugar needs according to the body's needs through a healthy diet. In the management of controlling blood sugar levels, 86.2% of diabetes mellitus sufferers adhere to the recommended diabetes mellitus diet pattern, but in fact the number of diabetes mellitus sufferers who are disciplined in implementing a diet program is only around 23.9% (Hestiana, 2018).

Compliance with diet is one factor in stabilizing blood sugar levels to normal and preventing complications. DM diet compliance with meal planning is one of the challenges in managing diabetes mellitus. To help clients incorporate dietary habits into their lifestyle, behavioral therapy, group support and education about the DM diet are highly recommended.

The factors that influence a person's non-compliance with a diabetes mellitus diet are a lack of knowledge about diabetes mellitus, confidence and trust in diabetes mellitus. Patient non-compliance in diabetes management will have a huge negative impact, including increased health costs and diabetes complications. Non-compliance with diet in diabetes mellitus patients is a risk factor for metabolic disorders in the body, causing blood sugar levels to increase and impacting survival. Diabetes mellitus will cause complications if blood sugar levels are left uncontrolled and will cause death. Complications can arise such as heart disease, kidney disease, blindness and amputation. Knowledge of the diabetes mellitus diet is the first step in increasing diabetes patient compliance regarding their diet patterns. Compliance with diabetes patients in implementing a diet is the main key to the stability of the health condition of diabetes mellitus patients (Triana. Riza, Darwin Karim, 2020).

Based on research (Massiani et al., 2023) shows that there is a relationship between the level of knowledge and diet compliance in diabetes mellitus sufferers. So, it is hoped that DM sufferers can always adhere to the diet recommended by health workers to be able to sort out which foods can be eaten or not by DM sufferers. Furthermore, research (Triana. Riza, Darwin Karim, 2020) shows that there is a relationship between the patient's level of knowledge about disease and diet and compliance with the DM diet. Patients with a high level of knowledge have the opportunity to be 7 times more compliant in following the DM diet compared to respondents who have a low level of knowledge. Based on this background, researchers are interested in conducting this research regarding "The Relationship between Knowledge Level and Low Carbohydrate Diet Compliance Level in Type II Diabetes Mellitus Patients at the Lowa Community Health Center, Bontosikuyu District, Selayar Islands Regency, Makassar, South Sulawesi".

METHOD

This research is based on quantitative data. Quantitative research uses techniques to investigate a specific population or sample. Using a cross-sectional approach. Cross sectional is a study that studies the relationship between independents and dependents which is carried out once

and at the same time. The population in this study was 168 people with a sample size of 118 respondents who met the research inclusion and exclusion criteria. The data collection process used a questionnaire. for both variables, both independent and dependent variables, the data collected will be processed starting from editing, coding, processing, cleaning so that it can be analyzed using the SPSS program in both univariate and bivariate analysis between two variables with a significance level of $\alpha < 0.05$ which means there is a relationship between the two independent and dependent variables so that the research hypothesis is answered. The results of data analysis will be displayed in the research results table for discussion which will be linked to related theories.

Results

1. Univariat Anlysis

a. Respondent Characteristic

1. Respondent Charasteristic base on Gander

Gander	Frequancy (n)	Persentation (%)
Male	63	53.4
Female	55	46.6
N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 1, it can be seen from 118 respondents that the male gender was 63 respondents (53.4%) and the female gender was 155 respondents (46.6%).

2. Respondent Charasteristic base on Age

Age	Frequency (n)	Persentation (%)
< 50 tahun	13	11.0
≥ 50 tahun	105	89.0
N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 2 of 118 respondents, it can be seen that the majority of respondents aged ≥ 50 years with the number 105 respondents (89%) and age < 50 years with a total of 13 respondents (11%)

3. Respondent Charasteristic base on level education

Level education	Frequency (n)	Presentation (%)
Not attending in school	7	5.9
Elementary school	8	6.8
Junior high school	33	28.0
Hihg school	50	42.4
University	20	16.9
N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 3 of 118 respondents, it can be seen that the majority of respondents have a highschool education with a total of 50 respondents (42.4%), a junior high school education with a total of 33

4. Respondent characteristic base on job

Job	Frequency(n)	Persentation (%)
Housewife	52	44.1
Businessment	47	39.8
Farmer	10	8.5
Gaverment working /ArmyI/Police	6	5.1
No work	3	2.5
N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 4 of the 118 respondents, it can be seen that the majority of respondents work as domestic workers with a total of 52 respondents (44.1%), entrepreneurs with a total of 47 respondents (39.8%), farmers with a total of 10 respondents (8.5%), civil servants/TNI/POLRI with the number of 6 respondents (5.1%) and not working with the number of 3 respondents (2.5%)

b. Independent Variable (knowledge level)

Knoledge level	Frequency (n)	Persentation (%)
Good	51	43.2
Midle	50	42.4
less	17	14.4
N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 5 of the 118 respondents, it can be seen that the majority of respondents in the good knowledge level category were 51 respondents (43.2%), 50 respondents had a sufficient level of knowledge (42.4%) and 17 respondents (14.4%) had a poor level of knowledge

c. Dependet variable (carbohydrat diet complence)

Level of carbohydrate compliance	Frequency (n)	Persentation (%)
Comlience	94	79.7
Not compliance	24	20.3

N	118	100.0

Source: Perimer data processed by SPSS, 2024

Based on table 6 of the 118 respondents, it can be seen that the majority of respondents adhered to a carbohydrate diet, namely 94 respondents (79.7%) and 24 respondents (20.3%) did not adhere to a carbohydrate diet.

2. Bivariat Analysis

Tingkat Pengetahuan	Tingkat Kepatuhan Diet Karbohidrat				N		*p-Value*	*α*
	Complience		Not complience					
	n	%	n	%	n	%		
Good	51	43.2	0	0	51	43.2	0.000	0.05
Midle	43	36.4	7	5.9	50	42.3		
Less	0	0	17	14.5	17	14.5		
N	94	79.6	24	20.4	118	100.0		

Source: Perimer data processed by SPSS, 2024

Based on table 7 of the 118 respondents, it can be seen that the highest level of knowledge in the category of good knowledge and compliance with the carbohydrate diet was 51 respondents (43.2%). Meanwhile, the lowest in the category of sufficient level of knowledge and non-compliance with the carbohydrate diet was 7 respondents (5.9%). Based on the results of the chi square test, it was found that p-value = 0.000 p<0.05, which means that Ha was accepted and H0 was rejected, so it can be concluded that there is a relationship between the level of knowledge and the level of compliance with a low carbohydrate diet in type II diabetes mellitus patients at the Lowa Community Health Center, Bontosikuyu District, Regency. Selayar Islands, Makassar, South Sulawesi.

Disscussion

1. Level of knowledge about low carbohydrate diets in type II diabetes mellitus patients

Based on the research results, there are variations in the level of knowledge of respondents regarding the management of diabetes mellitus (DM). The highest level of knowledge was recorded in the good category, with 51 respondents (43.2%), while the lowest level of knowledge was in the poor category, with 17 respondents (14.4%). This knowledge includes an understanding of various aspects of managing DM, such as participation in education programs, implementation of physical exercise or sports, use of therapy, and implementation of the "3J" diet which involves the type of food, amount and schedule of meals, as well as an understanding of the complications of DM. It is hoped that the knowledge possessed by DM sufferers can be applied effectively in daily life, so that they are able to recognize symptoms and complaints that arise, maintain body comfort, regulate blood sugar levels, and prevent potential complications from arising.

The results of this research are in line with research conducted by (Massiani et al.,

2023) which shows that the highest knowledge of respondents was in the quite good category, namely 27 respondents (40.9%). This research is also in line with research (Triana. Riza, Darwin Karim, 2020) which states that the majority of respondents' knowledge of DM disease and diet is good, namely 18 people (54.5%). Then research (Nalole et al., 2021) shows that there is a relationship between knowledge and dietary compliance in diabetes mellitus patients.

Knowledge, or the ability to know, is the result of humans' process of capturing information through their five senses. The five senses include sight, hearing, smell, feeling and touch. When humans capture information to gain knowledge, factors such as the level of attention and perception. From the explanation above, it can be assumed that knowledge about the management of diabetes mellitus (DM) is very important in forming compliance behavior for DM sufferers. One important aspect of DM management is controlling carbohydrate consumption. Carbohydrates have a direct impact on blood glucose levels, so regulating carbohydrate intake is key in controlling blood glucose levels for DM sufferers. Good knowledge about the types of carbohydrates, the right amount to consume, and how to measure or calculate carbohydrates in food are very important things for DM sufferers.

With a good understanding of this, DM sufferers can develop healthy behaviors such as choosing the right food, measuring and controlling carbohydrate intake, and paying attention to the body's response to carbohydrate consumption. Thus, knowledge about carbohydrate diets is one of the main foundations in DM management and helps DM sufferers to live healthy lives and prevent complications of DM.

2. Level of compliance with a low carbohydrate diet in type II diabetes mellitus patients

From the research results, it was found that the highest carbohydrate diet compliance was in the compliance category, namely 94 respondents (79.7%). DM diet compliance means that the sufferer has made a decision, believes and carries out the DM diet recommendations given by health workers. Recommendations given by health workers, in this case nutritionists, are focused on regulating the type of food, especially carbohydrate consumption, quantity and meal schedule in order to reduce blood sugar levels.

This is also supported by research (Bistara, 2018), showing that the compliance of DM sufferers in following a diet is partly good. The results of this study are also in line with research conducted by (Massiani et al., 2023) which showed that diet compliance was highest in the adherent category, namely 46 respondents (69.7%). This research is also in line with research (Triana. Riza, Darwin Karim, 2020) which states that the majority of patients adhere to the diet, namely 19 respondents (57.6%).

Compliance refers to an individual's desire to follow instructions or recommendations given by an authority, such as a doctor, nurse, or other health professional. This is defined as the active, voluntary, and collaborative participation of the patient in following instructions to achieve the desired therapeutic outcome. Adherence refers to a person's actions in taking medication on schedule, following a recommended diet, or making lifestyle changes in accordance with the advice of a health professional. This is a response to external stimuli or stimulation, and this response is greatly influenced by individual characteristics and other factors. A person's behavior is influenced by three main factors, namely predisposing, contingency and reinforcing factors (Insiyah & Hastuti, 2020).

From this explanation, it can be understood that adherence to diet has a very significant role in the management of diabetes mellitus. A proper diet can help diabetes sufferers to maintain a healthy body weight, reduce systolic and diastolic blood pressure,

control blood glucose levels, promote a better lipid profile, as well as increase insulin receptor sensitivity and improve the blood coagulation system. One important aspect of diet for diabetes sufferers is regulating carbohydrate intake, because carbohydrates have a direct impact on blood glucose levels. By understanding and adhering to a proper diet, diabetes sufferers can better manage their condition and prevent complications that may arise.

3. Relationship between level of knowledge and level of adherence to a low-carbohydrate diet in type II diabetes mellitus patients

The results of the research using statistical analysis of the chi square test showed that the p-value = 0.000 $p<0.05$, which means Ha was accepted and H0 was rejected so it can be concluded that there is a relationship between the level of knowledge and the level of adherence to a low carbohydrate diet in patients with type II diabetes mellitus. at the Lowa Health Center, Bontosikuyu District, Selayar Islands Regency, Makassar, South Sulawesi.

In line with research (Massiani et al., 2023) which shows that there is a relationship between the level of knowledge and dietary compliance in diabetes mellitus sufferers in the Kereng Bangkirai Community Health Center Area. This research is also in line with research (Triana. Riza, Darwin Karim, 2020) which states that there is a significant relationship between knowledge of the DM diet and adherence to the DM diet.

Good knowledge about health, including knowledge about diabetes mellitus, can form better behavior in preventing disease, such as adherence to a carbohydrate diet in diabetes mellitus sufferers. This knowledge is the result of the sensing process through the five human senses, such as sight, hearing, smell, taste and touch. The majority of human knowledge is obtained through sight and hearing. Knowledge functions as a guide in shaping one's actions, and behavior that is based on knowledge tends to be more consistent than behavior that is not based on knowledge. Apart from that, the level of education also influences the learning process, where the higher a person's level of education, the easier it is for them to receive and understand information. The level of education also influences a person's ability to absorb and understand the knowledge gained, so in general, the higher a person's level of education, the better his knowledge. Thus, a good understanding of health, supported by adequate education, can strengthen adherence to a carbohydrate diet for people with diabetes mellitus, helping them to better manage their health condition (Wiwin A Muhammad et al., 2022).

DM sufferers have good knowledge, which will influence the diet compliance of DM sufferers. This is in accordance with the concept of behavior which states that behavior will be more persistent if it is based on knowledge so that it has the awareness to act. Patients who suffer from a disease with insufficient knowledge will cause the sufferer to be disobedient in carrying out recommendations from health workers (Hassan, 2013).

Knowledge is also formed by individual experience, environmental influences, and socio-cultural factors. This experience is interpreted and believed by the individual, which then triggers motivation and intention to act, ultimately encouraging the realization of certain behavior. Diabetes patients who have good knowledge and a positive attitude tend to be able to prevent complications from DM. Therefore, understanding the diabetes diet is crucial in ensuring consistency in implementing a healthy lifestyle and preventing complications related to the disease (Insiyah & Hastuti, 2020).

From this explanation, it can be assumed that insufficient knowledge about diabetes mellitus diets, especially low-carbohydrate diets, can be an obstacle in achieving optimal compliance in type II diabetes mellitus patients. Patients who do not adequately understand

the importance of the DM diet may have difficulty following the recommendations given by health workers. Therefore, it is important to increase patient understanding of low-carbohydrate diets through effective education and providing clear and easy-to-understand information, which can help increase patient compliance with the recommended diet and improve blood sugar control and overall disease management.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the analysis of the relationship between the level of knowledge and the level of adherence to a low carbohydrate diet in type II diabetes mellitus patients at the Lowa Community Health Center, Bontosikuyu District, Selayar Islands Regency, Makassar, South Sulawesi with a p-value = 0.000, p<0.05. The limitations of this research are the lack of a sample or the sample size is still relatively small and the research design is not strong enough, so it is hoped that future research can use a strong research design, for example a cohort research design

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