Relationship Between The Size Of The Portion Of The Diet Served And Blood Sugar Levels In Patients With Type 2 Diabetes Mellitus

Rita Juniara Kasih[1], Laila Apriani Hasanah Harahap[2], Suci Eka Putri[3], Teuku Muliadi[4]

[1,2,3,4] Nutrition Study Program, Universitas Teuku Umar, Aceh, Indonesia
Corresponding Author : lailaapriani@utu.ac.id

Abstract. *Diabetes mellitus is a chronic metabolic disorder characterized by increased blood sugar levels. Poor eating patterns, including inappropriate meal times and inappropriate amounts of food consumption, can affect blood sugar levels in the body.The aim of this research isto determine the relationship between the size of the diet portion served and blood sugar levels in Diabetes Mellitus patients at RSUD Datu Beru Kab. Central Aceh in 2023.The method used is a quantitative method,analytical observationalwith approachcross-sectional. This research was carried out from September 2023 to May 2024. The type of data is primary data obtained from the patient's general description questionnaire and data on the portion size served was obtained from direct weighing and secondary data was obtained from the patient care book, namely data on blood sugar levels 2 hours after eating. The method for collecting data is by using questionnaire sheets, checking maintenance books and eating scales. Data analysis was carried out using univariate and bivariate analysis using the Fisher exact test. The research results showed that as many as 82.0% had high kgd (>180mg/dl) and 18% had normal kgd (80-179mg/dl). There were 23.6% good portions served and 76.4% poor food portions. The results of the Fisher test show p <0.05 (0.002) and have a PR value >1 (4.2) which is a risk factor between the size of the portion served and the blood sugar levels of patients with type 2 diabetes mellitus. The conclusion is that the size of the portion served is partly The size does not match the standard portions served, causing respondents to have higher blood sugar levels 2 hours after eating. There is a significant relationship and 4 times higher risk between the size of the diet portion and blood sugar levels in patients with type 2 diabetes mellitus. Suggestions for Hospitals should improve the quality of health services, especially food services, and nutritionists/nutritionists should be able to supervise the portioning process to produce food portions that suit patient needs.*

Keywords: portion standards, portions served, blood sugar levels, and type 2 diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM), also known as diabetes, is a serious condition that occurs when there is an increase in blood glucose levels due to the body's inability to produce or metabolize insulin or use the insulin produced efficiently. (IDF, 2019).DM can usually be characterized by a blood glucose test result of >200 mg/dL (11.1 mmol/L) or fasting plasma glucose >126 mg/dL (7.0 mmol/L) (Hestiana, DW 2017). Diabetes mellitus is divided into 3 groups, namely type 1 diabetes, type 2 diabetes, and gestational diabetes (Perkeni, 2021). Diabetes mellitus is a group of metabolic disorders that can be characterized by an increase in blood glucose levels that exceed the threshold due to abnormalities in the work or production of insulin.Bilous and Donelly, 2015).

According to data from the World Health Organization 2022, there is a 5% increase in the number of diabetes mellitus sufferers in the elderly population or 422 million people worldwide. Especially in countries with weak, unstable economies. It is estimated that in people under 70 years of age, there is a 2 million risk of developing diabetes mellitus. There

may even be a sustainable increase of around 600 million people by 2035 (WHO). International Diabetes Federation, Indonesia is included in the top 10 countries in the world, along with China, India, the United States, Pakistan, Brazil and Mexico. Among people aged 20 to 79 years, there are around 10.7 million diabetes sufferers (IDF, 2021). One of the provinces in Indonesia that has the highest DM prevalence rate is the Special Capital Region (DKI) Jakarta (East Jakarta Health Sudinkes, 2021). According to the Aceh Health Service 2016, the prevalence of diabetes mellitus sufferers was 80,178 people or 20% of the total population collected in 2016 specifically for Aceh who were diagnosed by doctors. Data from the Central Aceh District Health Service, diabetes mellitus was included in the 10th most common disease in Central Aceh District in 2018, Diabetes Mellitus itself entered 9th place with a total of 2,195. (BPS Central Aceh, 2019).

Improper eating patterns, including irregular meal times and the inappropriate amount of food consumed can affect blood sugar levels in the body (Widiyoga, 2020).Portion standards provide information about the type and amount of food ingredients in the net amount of each dish, expressed in exchange units based on the food standards applicable in the institution. In organizing mass meals, it is necessary to have portion standards for each type of dish and the number of dishes to be clearer. All types of food must have standardized portions and the use of measuring tools (such as ladles, ladles, or dividing spoons) to comply with food portion standards requires supervision to maintain the quality of food served in hospitals (Wibowo, Rohanta & I Gede, 2018). Portion size is the amount of food served in the portion served by the hospital to individuals. In a food service, portion sizes are closely related to calculating food ingredient needs and planning portion standards (Wibowo, Rohanta & I Gede, 2019). Portion sizes often lead to errors in serving food, especially in food portioning. Meal menu portioning is a procedure for preparing food according to predetermined portion standards (Ambarwati, 2016). Factors that influence the accuracy of portions are the amount of food being processed, the ability of the cooking staff to portion, and the staff in charge of food distribution (Cendanawangi, DN, Tjaronosari, T., & Palupi, IR 2016). Special diet portioning is the distribution of special diet foods to each patient according to request using food boxes/food labels using hospital food delivery standards in the form of URT (Ambarwati (2016).

Based on the results of a preliminary survey which was carried out for 30 days in February 2023 at the Datu Beru Takengon Regional General Hospital (RSUD), there was a discrepancy in the diet provision between the standard diet portions and the portion size served in the nutrition installation, which was feared to increase blood sugar levels. The

patient's blood is unstable. Based on a preliminary survey, the researchers were interested in conducting research on the relationship between the size of the diet portions served and blood sugar levels in type 2 diabetes mellitus patients at Datu Beru District Hospital. Central Aceh.

RESEARCH METHODS

The type of research used is analytical observational with a cross sectional design. This research is to look at the relationship between the size of the portion of the diet served and blood sugar levels in patients with type 2 diabetes mellitus. The population in this study were all diabetes mellitus (DM) patients from January to August 2023 at Datu Beru Hospital, Takengon City, totaling 151 inpatients. In determining the sample size, use the binominal proportion formula. From the calculation results, the number of samples is 89 people. In this research there are two variables, namely the independent variable, namely the variable that is the cause of the emergence or change in the dependent (dependent) variable. The independent variable in this research is the size of the diet portion served. The dependent variable in this study is the level of blood sugar levels in type 2 diabetes mellitus patients.

This research will be carried out in the inpatient room and nutrition installation at Datu Beru District Hospital. Central Aceh. This research was carried out from September 2023 to May 2024. The tools used in this research are questionnaires,electric scales,camera, and patient status book. Research usesThis univariate analysis aims to describe or explain the characteristics of each study, presented in the form of distribution and percentage of each variable. Bivariate analysis uses the Fisher Exact Test, the Fisher Exact Test values are seen in the chi square table. Bivariate analysis shows a relationship or correlation between two quantitative variables which can be seen with a significant value of <0.05 on the Fisher exact test table. The variable used is related or correlated, namely the variable size of the portion of the diet served to blood sugar levels.

RESULTS

Frequency distribution of characteristics of type 2 diabetes mellitus patients

Table 1 Frequency distribution of characteristics of type 2 diabetes mellitus patients at Datu Beru Regional Hospital

Variables	Frequency	Percentage(%)
Age (years)		
30-39 years old	4	4.5
40-49 years old	18	20.2
50-59 years old	37	41.6
60-69 years old	25	28.1
70-79 years old	5	5,6
Total	**89**	**100.0**
Gender		
Woman	56	62.9
Man	33	37.1
Total	**89**	**100.0**

Based on the results of table 1, it was found that the frequency of age characteristics of patients suffering from diabetes mellitus was most dominant in the age group 50 to 59 years amounting to 37 people with a percentage of 41.6% and the age group 60 to 69 years amounting to 25 people with a percentage of 28.1%. The frequency of gender characteristics of patients with diabetes mellitus was 56 women with a percentage of 62.9% and 33 men with a percentage of 37.1%.

Blood sugar levels in patients with type 2 diabetes mellitus

Table 2 Frequency distribution of blood sugar levels in patients with type 2 diabetes mellitus at Datu Beru Regional Hospital

KGD 2 Hours PP	Frequency	Percentage %
Normal	16	18.0
Tall	73	82.0
Total	**89**	**100.0**

Based on the research results in table 2, it shows that respondents with normal KGD were 16 people with a percentage of 18.0% and high KGD were 73 people with a percentage of 82.0%.

Diet portion served to patients with type 2 diabetes mellitus

Table 3 Frequency distribution of portions served to type 2 diabetes mellitus patients at Datu Beru Regional Hospital.

Portions served	Frequency	Percentage %
Good	21	23.6
not enough	68	76.4
Total	**89**	**100.0**

Based on the research results in table 3, it shows that 21 people served good diet portions with a percentage of 23.6% and 68 people served inappropriate portions with a percentage of 76.4%.**.**

The relationship between the portion size served and blood sugar levels in type 2 diabetes mellitus patients

Table 5 Relationship between portion size served and blood sugar levels in type 2 diabetes mellitus patients

Large portions served	Blood Sugar Levels				Total		P value	PR
	Normal		Tall					
	n	%	n	%	n	%		
Good	9	42.9	12	57.1	21	100	0.002	4.2
Not enough	7	10.3	61	89.7	68	100		
Total	**16**	**18.0**	**73**	**82.0**	**89**	**100**		

Based on table 5, the results show that the portion sizes served are good and those with normal blood sugar levels are 42.9% and those with high levels are 57.1%, while those with portion sizes served are less and those with normal blood sugar levels are 10% and those with high there are 89.7%. Results from statistical tests usingFisher's Exact TestThe obtained p value = 0.002 <0.05 and has a PR (prevalence ratio) value of 4.2 > 1 where the confidence

interval range beyond 1 is a risk factor. So it can be concluded that the portion size served is significantly related and is a risk factor for the blood sugar levels of diabetes mellitus patients.

DISCUSSION

Large portions served

The results of the research conducted showed that the portion size served was a small portion, namely 21 people (23.6%) in the good category and the majority, namely 68 people (76.4%) in the poor category. The size of the portions served can be concluded that the staple food (rice) from the food weighing results is classified as insufficient, because most of the weighing results show that the portions served are more than or less than the standard portions that have been set. The portioning of food for diabetes mellitus patients served at Datu Beru Regional Hospital is carried out using household measurements (URT) which have been standardized for standard portions, however distribution officers sometimes still use spoons of different sizes which causes incongruence in the portions served, which is a concern for nutritional needs. It is not guaranteed that it can be met by every patient, especially for patients who have special diets.

Food weighing for diabetes mellitus patients is classified as not complying with portion standards due to errors by distribution officers in using different sized spoons for each officer and lack of attention by nutrition officers/nutritionists in the use of tools by distribution officers, which results in inappropriate portioning. given to diabetes mellitus patients. Where diabetes mellitus sufferers should reduce consumption of carbohydrates which is quite high and reduce consumption of foods that contain a high glycemic index such as white rice which can increase blood sugar levels. Portioning is the process of dividing food into the patient's cutlery according to portion standards. Portioning models can be used by serving staff to make portioning easier (Fatkhurohman et al., 2017). Food portioning refers to the process or method of preparing food according to predetermined portion standards. The portion standard is the number of types and ingredients in the net amount in each dish.

In organizing food in hospitals, standard portions are needed for each dish, so that the type and quantity of dishes are clear. Portion standards must be met for all types of food and the use of equipment such as ladles, ladles, dividing spoons must be standardized (Ambarwati, 2016). What often happens during portioning activities is an error in the weight of the dish being portioned. The weight of the portioned dish must not exceed/become less than the existing portion standards. The portion weight of the resulting dish has the potential to have a negative impact on the nutritional value contained in the dish (Astuti, 2018). Based on

research findings, differences in the ability of the portioning staff to carry out portioning and having never attended training related to portioning can cause discrepancies in carrying out portioning, so that regular training and education related to portioning is needed so that the portioning staff are more skilled in portioning dishes (Apriliani et al., 2019).

Food portion standards greatly influence food management related to the nutritional value of food. If the food portion is less or more than the predetermined standard, then the nutritional value of the patient's food is reduced or excessive, which can cause the quality of the food to be less than good (Ambarwati, 2016). Based on Ambarwati's research results, in 2016 the level of staple food consumption was 0%, meaning that the waiter's dosage did not comply with the Heart Diet II standards. The recommended portion size for rice porridge is 200 gr. The planned portion size for rice porridge is 200 gr, while the waiter's measurements are 250 gr, 260 gr and 280 gr. This amount is quite large because it exceeds the recommended portion size and exceeds the 10% compensation limit. Regarding the waiter's porridge intake, namely 2.5 large vegetable spoons. Usage according to URT: 200 grams of rice porridge or 2 tablespoons of freshly squeezed vegetables.

Blood sugar levels

From the results of research conducted by researchers regarding blood sugar levels 2 hours after eating, patients showed that of the 89 samples studied, a small proportion of KGD 2 hours before eating was in the normal category, namely 16 people (18.0%) and the majority was 73 people (82.0%) in the high category. It can be concluded that kgd 2 hours after eating is classified as high. Based on Niken C's research, 2021 Results of Blood Glucose Level Examination 2 hours post prandial, the results obtained were based on blood tests when the patient received food containing carbohydrates and the blood sugar levels of Type II DM patients at Sawahlunto Hospital were checked 2 hours after eating, showing better results. a lot, namely increasing with a frequency of 16 with a percentage of 53.3% while normal with a frequency of 14 with a percentage of 46.7%. The average examination value 2 hours post-oral was 229 mg/dl.

In research conducted by Setyo, 2015 at the internal medicine polyclinic of RSDK Semarang with a total of 60 respondents, this shows that regulating the number of food portions has a significant relationship with the successful management of type 2 DM.

The relationship between portion size served and blood sugar levels in type 2 diabetes mellitus patients

From the results of research conducted by researchers, there is a correlation between the size of portions served and blood sugar levels in diabetes mellitus patients, that of the 89 samples studiedIt was found that the size of the portion served was good and had normal blood sugar levels of 42.9% and high levels of 57.1%, while those with large portions served were less and had normal blood sugar levels of 10% and high levels of 89.7. %. The obtained p value = 0.002 <0.05 and has a PR (prevalence ratio) value of 4.2 > 1 where the confidence interval range beyond 1 is a risk factor. So the results obtained were that the portion size served was significantly related and was a risk factor for the blood sugar levels of diabetes mellitus patients.

Based on the results of research conducted by Maria Helena D, 2020, the accuracy of the rice portion standards that researchers have carried out shows that most of them are appropriate (85.7%), namely 6 out of 7 respondents. It can be concluded that the accuracy of the rice portion standards from the weighing results during one day of food weighing is classified as appropriate, because there are only 14.3%, namely 1 out of 7 respondents, who do not match the size of the portion served with the patient's needs. Monitoring portion standards is needed to maintain the quality of the food produced, this can affect a person's nutritional needs. The results of research at Sanjiwani Regional Hospital showed that the results of rice portioning did not meet the portion standards. Morporator personnel factors include recent education and length of work, as well as the unavailability of appropriate portioning tools which are the causes of inaccuracy in the portioning (Arsyih et al., 2019).

Based on research resultsAstari, AP, Setyowati, S., & Kadaryati, S. 2021There are inappropriate categories in the portioning of staple foods in rice dishes, rice porridge and strained porridge. Rice is portioned using plastic bowls that have not been standardized by the hospital. The portioning of the team rice is done by dividing the team rice that has been printed on an aluminum board, thus producing a large dish depending on the thickness and number of pieces. Portioning rice porridge and strained porridge using a non-standardized vegetable ladle. The results of the percentage of accurate portioning show that only the portion of rice is included in the correct category. This is also in line with research at other hospitals which shows that the factor of inaccurate portioning of rice occurs due to the lack of skills of the serving staff, differences in the type of rice and the amount of water used when cooking the rice (Wadyomukti, 2017). The portioning of 100% vegetable side dishes is not appropriate.

Research at Bahteramas Regional Hospital also shows that the portion size of vegetable side dishes is 80.35% not in accordance with portion standards (Astuti, 2018). There are obstacles in portioning, namely differences in estimates in determining the weight of the dish being portioned, the portioning staff and the tools used in portioning the dish (Apriliani et al., 2019). Novyanda, et al (2917) said that DM sufferers will easily lose weight because their energy needs are not met if they consume less calories. On the other hand, high calorie consumption will increase blood glucose levels, thereby increasing the blood glucose load in DM sufferers.

CONCLUSION

Based on the research results, it can be concluded that:

1. Large portions served by staple food (rice) in the morning for patients with diabetes mellitusat Datu Beru Regional Hospital, Kab. Most of Central Aceh is in the inadequate (not suitable) category compared to the portion standards that have been set.

2. Respondents who had normal blood sugar levels 2 hours after eating (glucose 2 hours post prandial) (80-179mg/dl) were 16 people (18%), high (>180mg/dl) were 73 people (82.0%) .

3. There is a significant relationship p = <0.05 (0.002) and has a PR value >1 (4.2) which is a risk factor between large diet portions and blood sugar levels in diabetes mellitus patients at Datu Beru District Hospital. Central Aceh..

SUGGESTION

1. For educational institutions, in this case Teuku Umar University, they can use the results of this research in the teaching and learning process.

2. For hospitals to improve the quality of services, especially food services, namely standard portions or diets for diabetes mellitus and other diseases that require special diets.

3. For health workers, especially nutrition officers/nutritionists, to be able to supervise the portioning process carried out by distribution officers in order to produce food portions that suit the needs or diet for patients with diabetes mellitus and diseases that require other special diets.

4. It is hoped that future researchers will examine other variables that have not been studied, related to the portioning of lunch and afternoon meals for patients suffering from diabetes mellitus, and the weight of food portions (vegetable side dishes, animal

side dishes, vegetables and fruit) served from nutrition installations to patients suffering from diabetes. mellitus and other diseases at Datu Beru Regional Hospital.

REFERENCES

Ambarwati, R. (2016). The Field Lecture Practical Report (PKL) establishes Hospital Standards and Calculations of Food Requirements at Penabahan Senopati Bantul Regional Hospital. Yogyakarta Ministry of Health Polytechnic. Thesis.

American Diabetes Association. (2019). Standards Of Medical Are In Diabetes 2019 (1st ed., Vol. 42, pp. 2–6). USA: American Diabetes Association. Retrieved September 10, 2020 from https://care.diabetesjournals.org/content/42/Supplement _1

Apriliyani, S., et al. (2019). Accuracy of Vegetable Portioning Against Usual Food Portion Standards. Prima Nutrition Journal, 4(2), 97. doi: 10.32807/jgp.v4i2.138.

Astari, A. P., Setyowati, S., & Kadaryati, S. (2021). The accuracy of serving dishes at RSUD Dr. Tjitrowardojo Purworejo. Action: Aceh Nutrition Journal, 6(1), 33-40.

Astuti, I. A. E. (2018). Description of the Appropriateness of Food Portion Standards in Hospitals and the Portion Sizes Served in the Nutrition Installation of Bahteramas Regional Hospital, Kendari City. New England Journal of Medicine, 372(2).

Bilous, R., & Donelly, R. (2015). Diabetes Handbook (4th ed.). Jakarta: Bumi Medika.

Cendanawangi, D. N., Tjaronosari, T., & Palupi, I. R. (2016). Portion accuracy is related to food intake in the elderly at the Tresna Werdha Budi Luhur Social Home, Bantul, Yogyakarta. Indonesian Journal of Nutrition and Dietetics, 4(1), 8-18.

Dewi, I. A. K. A. S. (2022). Description of Blood Glucose Levels in Diabetes Mellitus Patients with Diabetic Feet at Mangusada Badung Hospital in 2022 (Doctoral dissertation, Denpasar Ministry of Health Polytechnic, Nursing Department).

Dinanda, O. I. T., Tjarono, S., & Lastmi, W. (2019). Study of the Accuracy of Portions and Nutritional Value of Animal Side Dishes on Non-Diet Menus at the Nutrition Installation of RSUD Dr. Moewardi (Doctoral dissertation, Poltekkes Kemenkes Yogyakarta).

Fatkhurohman, F., Lestari, Y. N., & Torina, D. T. (2017). The Relationship between Changes in Meal Portion Standards and Food Waste in Holistic Hospital Patients in 2016 (Study of Leftover Rice on the Diet Lunch Menu in Holistic Hospitals). Indonesian Nutrition, 40(1), 1. doi: 10.36457/gizindo.v40i1.218.

Hestiana, D. W. (2017). Factors associated with compliance in diet management in type 2 diabetes mellitus outpatients in the city of Semarang. Journal of Health Education, 2(2). Retrieved September 11, 2020 from https://doi.org/10.1080/10556699.1994.10603001

International Diabetes Federation (IDF). (2021). International Diabetic Federation Diabetic Atlas (10th ed.).

Nita, M. H. D., Nur, A., & Kayumu, H. A. K. (2020). Accuracy of Rice Portion Standards for Diabetes Mellitus Patients at RSUD Prof. Dr. WZ Johannes Kupang. Nutriology: Journal of Food, Nutrition, Health, 1(2), 49-53.

PERKENI. (2021). Guidelines for the Management and Prevention of Diabetes Mellitus Type 2 in Indonesia. Perkeni.

Siregar, L. M., Hutajulu, J., Syapitri, H., & Sikutiro, H. (2022). The relationship between diet adherence and quality of life in diabetes mellitus sufferers at the Lut Tawar Community Health Center, Lut Tawar District, Central Aceh Regency. Journal of Public Health and the Environment, 7(2), 153-157.

Wadyomukti, R. A. (2017). The relationship between the characteristics of portioning personnel and portioning equipment with the accuracy of portioning staple foods based on portion standards at PKU Uhamadiyah Hospital, Bantul. Ministry of Health Health Polytechnic. Thesis.

Wayan Sari., Anwar., Amri. (2018). Institutional Food Delivery System Management. Nutrition Teaching Materials. Health Human Resources Education Center. Ministry of Health of the Republic of Indonesia. Jakarta.

Wibowo, S., Rohanta, S., & Gede, S. (2019). Mass Food Delivery System Management: In Hospitals and Hotels. Jakarta: EGC Medical Book Publisher.

Widiyoga, C. R., Saichudin, & Andiana, O. (2020). Relationship between the level of knowledge about diabetes mellitus in sufferers and the regulation of eating patterns and physical activity. 2(2), 152–161.

Word Health Organization. (2022). Classification of Diabetes Mellitus. Retrieved from https://www.who.int /publications /i/item/classification-of-diabetes-mellitus.