



RELATIONSHIP OF MACRO NUTRITION CONSUMPTION PATTERNS WITH LIPID PROFILE IN TYPE II DIABETES MELLITUS PATIENTS

Teguh Budiharjo¹, Didik Widiyanto², Djoko Priyatno³

^{1,2,3}, Health Polytechnic Ministry of Health Semarang, Indonesia

Email: teguhbudiharjo@yahoo.co.id

Article details:

Received: 24th July 2021

Accepted: 28th July 2021

Published: 8th August 2021



Abstract

Diabetes mellitus (DM) is a disease caused by metabolic disorders both genetically and clinically characterized by an increase in blood sugar (hyperglycemia) chronically. Intake of carbohydrates, fats, proteins is a factor that can control the body's glycemic. Poor glycemic control is thought to have contributed to changes in lipid profiles in DM patients. The purpose of this study was to determine the relationship between carbohydrate, fat, and protein intake with the lipid profile of patients with Type II DM.

Cross sectional design method with 3 days recall and lipid profile levels. The research sample is a consecutive sampling of 31 samples. The analysis used Univariate and Bivariate and the data were analyzed by correlation test.

The results of the correlation test showed that the average respondent's blood sugar level was 297 mg/dl $\pm$ up to 90, the average intake of carbohydrates = 339.9 grams $\pm$ SD 139.32, fat = 128.6 grams $\pm$ SD 177.222 and protein = 51.1 gram $\pm$ SD 22.42. The average lipid profile is Triglyceride level = 179.9 mg/dl $\pm$ SD 111.99, total cholesterol level = 199.93 mg/dl $\pm$ SD 59.91, HDL level = 40.0 mg/dl $\pm$ SD 10.74, LDL level = 146.77 mg/dl $\pm$ SD 181.29. Bivariate test there was a significant relationship between fat intake and triglycerides at $P=0.009$ ($p \leq 0.05$), the relationship between fat with LDL with a value of $P=0.018$ ($p \leq 0.05$), the relationship between protein intake and cholesterol at $P=0.030$ ($p \leq 0.005$). Intake of nutrients that have a significant relationship is fat with triglycerides, fat with LDL and protein with cholesterol.

Keywords: Carbohydrate intake: fat: protein: lipid profile: type II DM.

To cite this article :

Teguh Budiharjo, Didik Widiyanto, D. P. (2021). teguh budiharjo ijhes. *International Journal of Health, Education and Social (IJHES)*, 4(7), 35–43.



Introduction

Diabetes Mellitus is a complex problem, indicated by the many complications that can be caused including microvascular and macrovascular complications as well as acute complications (Bertalina et al., 2018). Recently, DM has attracted more and more attention because of its increasing prevalence. In 2010 the number of people with DM in the world reached 306 million people, and data shows that in Indonesia the prevalence of DM continues to increase (Santoso et al., 2020). Based on a study conducted by Prihatin et al (2018), it is stated that several factors increase the risk of experiencing hyperlipidemia in type 2 DM patients. These causative factors are divided into two groups. The first group is called the demographic risk and clinical data, including: age over 60 years, gender male, duration of DM more than 10 years, family with cardiovascular disease (Ramie et al., 2019). The second group is called the laboratory data risk factors. These risk factors include: high HbA1c levels, high cholesterol levels, low HDL levels, high non HDL cholesterol levels, high triglyceride levels, high triglyceride/HDL ratio, and others (Hartono et al., 2019).

DM is a chronic disease that cannot be cured but has the potential to be prevented through management diabetes mellitus. The main pillars of DM management are diet/food planning, physical exercise and hypoglycemic drugs; therefore the success or failure of DM disease management is very dependent on the patient in carrying out adequate dietary compliance, including a diet that is able to control glycemic (Dhini et al., 2018).



Nutrient intake, especially macronutrients, is a factor that can control the body's glycemic index. Poor glycemic control is thought to have contributed to changes in lipid profiles in patients with DM. Hyperglycemic conditions are thought to have direct and indirect effects on blood vessels. Indirect effects of hyperglycemic conditions are estimated through their effects on lipid profiles (Ramie et al.,2018).

There are relatively many patients with DM at the Sunan Kalijaga Regional General Hospital, Demak, during the period from January to December 2018 there were around 537 patients with a disease prevalence of 3.2%. Patients who undergo hospitalization are 45 people per month on average. Patients with DM always need to have their lipid profile checked in addition to blood sugar for planning adequate diet (Asbaghi et al.,2020). Examination of the synergism between blood sugar and lipid profile examination in DM patients has never been studied at the Sunan Kalijaga Hospital, thus, this study is important because of the condition of blood sugar and lipid profiles in DM patients in order to avoid greater risks such as Coronary Heart Disease (Shahid & Sarwar, 2020). The results of the observation of blood sugar examination data for DM patients in class 2 and wards were obtained routinely, but lipid profile examination data were not obtained because no examination was carried out. Examination of lipid profiles and blood lipids becomes important in DM patients, related to diet planning for hyperglycemic control (Kusumo et al.,2020).



Based on these considerations, the researcher wanted to know and examine how the relationship between micronutrient consumption and lipid profile of patients with type II diabetes at Sunan Kalijaga Hospital, Demak, Central Java, Indonesia.

Methods

This study used an analytical research design using a cross-sectional approach to determine the relationship between macronutrient consumption and lipid profile in patients with Type II DM at Sunan Kalijaga Hospital, Demak. The research object was only observed once and measurements were made on the status of characters or variables object at the time of examination by approaching and collecting data at the same time (Kot & Rajiani, 2020).

This research was conducted in the internal medicine ward of the Sunan Kalijaga Hospital, Demak, Central Java. The samples were taken from September 2019 to November 2019.

The collected data was then analyzed using SPSS. Univariate analysis in this study will describe the frequency distribution of sex, consumption of macronutrients including carbohydrates, protein, fat, GDS levels, total cholesterol levels, HDL cholesterol levels, LDL cholesterol levels, and triglyceride levels using SPSS 20.0 software. Bivariate analysis was carried out using the Pearson correlation test (parametric test), if it meets the requirements. If it



does not meet the requirements, then an alternative test is used, namely the Spearman correlation test (non-parametric test). Pearson's correlation coefficient was used to determine the significance and strength of the relationship between variables. Values of $P < 0.05$ was declared statistically significant. In addition, the direction of correlation was included.

Results and Discussion

Relationship between fat consumption and lipid profile in Type II DM patients is displayed on the following table.



Table 1. Relationship between fat consumption and lipid profile in Type II DM patients

Category	Mean	SD	P
Fat Intake	128.66	± 177.222	0.009
Triglyceride Level	179.90	± 111.99	0.009
Fat Intake	128.66	± 177.222	0.125
Cholesterol Level	199.93	± 59.91	0.125
Fat Intake	128.66	± 177.222	0.585
HDL levels	40.00	± 10.74	0.585
Fat Intake	128.66	± 177.222	0.018
Consumption of LDL	146.771	± 181.29	0.018

The results of the study of data on fat consumption patterns with recall with blood triglyceride levels in type 2 DM patients obtained $P = 0.009$ ($p < 0.05$) meaning H_0 rejected. This means that there is a relationship between fat intake and triglyceride levels. The results of this study are in



accordance with research of Taufik et al (2018) which states that carbohydrate intake can increase blood triglyceride levels in patients with DM II. DM II patients with poor fat intake (less than 100% of total energy requirements) had 18.7 times higher triglycerides than respondents who consumed good fats (>100% total energy requirements).

Fat consumption is one of the factors that can trigger the accumulation of fat in adipose and cholesterol in macrophages, resulting in insulin resistance. Insulin resistance decreases lipoprotein lipase (LPL) activity, which in turn results in an increase in plasma triglyceride-rich lipoprotein (TG_{RL}) concentrations. The high concentration of plasma triglycerides (TG) increases the transfer of TG to LDL and HDL then simultaneously with the transfer of cholesterol esters from LDL and HDL to plasma TG where these reactions are mediated by Cholesterol Ester Transfer Protein (CETP). Furthermore, triglycerides will be hydrolyzed and produce small dense LDL particles which are more atherogenic than LDL (Ahmed, et al, 2021).

Conclusion and Recommendation

The patient's lipid profile level diabetes mellitus type 2 was obtained, the average triglyceride level was 179.9 ± 111.9 mg/dl, the average cholesterol level was 199.9 ± 59.9 mg/dl, the average HDL level was 40.0 ± 10.7 mg/dl, the average LDL level was 146 ± 181.29 mg/dl. There is no relationship between carbohydrate intake and blood triglyceride levels, there is no relationship between carbohydrate intake and cholesterol levels, there is no significant relationship between carbohydrate consumption and HDL levels, there is no significant relationship between carbohydrate intake and LDL levels. There is a relationship between fat intake and triglyceride



levels, there is no significant relationship between fat consumption and recall with cholesterol levels, there is no relationship between fat consumption and HDL levels. There is no significant relationship between protein consumption and triglyceride levels, there is no relationship between protein consumption and blood HDL levels, there is no significant relationship with blood LDL levels in patients with DM.

It is hoped that this will increase knowledge, especially regarding the relationship between the consumption of carbohydrates, fats, proteins and further lipid profiles as well as a source of information for the hospital to pay more attention to lipid profile examination in DM patients that it can be used as a reference for proper diet planning.



Acknowledgement

We thank for the opportunity given to obtain research funds from the Health Polytechnic of the Ministry of Health Semarang, so that the research can be accomplished.



References

1. Ahmed, F., Molham, A. H., Al-Zabedi, E., & Saif-Ali, R. (2021). Impact of triglycerides and waist circumference on insulin resistance and β -cell function in non-diabetic first-degree relatives of type 2 diabetes. *BMC Endocrine Disorders*, 21(1), 1-8.
2. Asbaghi, O., Sadeghian, M., Fouladvand, F., Panahande, B., Nasiri, M., Khodadost, M., ... & Sadeghi, O. (2020). Effects of zinc supplementation on lipid profile in patients with type 2 diabetes mellitus: A systematic review and meta-analysis of randomized controlled trials. *Nutrition, Metabolism and Cardiovascular Diseases*, 30(8), 1260-1271.
3. Bertalina, Hasan, A., & Rajiani, I. (2018). Analysis of Factors Associated with Blood Sugar Levels in Type 2 Diabetes Mellitus Patients. *Indian Journal of Public Health Research & Development*, 9(12), 391-395.
4. Dhini, D., Munifa, M., & Rajiani, I. (2018). Balanced nutrition menu intervention for toddlers in children daycare center. *Indian Journal of Public Health Research & Development*, 9(11), 147-151.
5. Hartono, R., Wijayati, S., & Rajiani, I. (2019). The Role of Physical Activity in Determining the Level of Older People's Depression. *Indian Journal of Public Health Research & Development*, 10(3), 599-603.
6. Kot, S., & Rajiani, I. (2020). Testing and Identifying Variable Dependency through the Fisher Exact Test in Central Europe Enterprises. *Ekonomicko-manazerske spektrum*, 14(1), 10-18.



7. Kusumo, M. P., Hendrartini, J., Sufro, Z. M., & Dewi, F. S. T. (2020). A qualitative study to explore the perception of patients towards diet in Javanese culture. *Enfermeria Clínica, 30*, 183-187.
8. Prihatin, S., Noormintarsih, S., Rahmawati, A. Y., Supadi, J., Gunawan, A. T., & Rajiani, I. (2018). The Nutrition Care Process (NCP) Impact to the Dietary Behavior of Diabetes Mellitus Patients. *Indian Journal of Public Health Research & Development, 9*(7), 38-42.
9. Ramie, A., Mahdalena, H., & Rajiani, I. (2019). ARCS Module (Attention, Relevance, Confidence, Satisfaction) to Increase Classroom Motivation for Pregnant Women at Public Health Center. *Indian Journal of Public Health Research & Development, 10*(1), 401-405.
10. Shahid, S. U., & Sarwar, S. (2020). The abnormal lipid profile in obesity and coronary heart disease (CHD) in Pakistani subjects. *Lipids in health and disease, 19*(1), 1-7.
11. Santoso, B., Susanto, E., Widyawati, M. N., Rahman, W. A., & Rajiani, I. (2020). Revitalizing School Dental Health Effort through " Model 222" as a Strategy to Achieve Caries-Free Indonesia 2030. *Systematic Reviews in Pharmacy, 11*(2).
12. Taufiq, I., Sulistianingsih, E., & Rajiani, I. (2018). Walking as an alternative treatment of HbA1c levels control among type 2 diabetes mellitus patients. *Indian Journal of Public Health Research & Development, 9*(9), 220-223.