



The Effect of Habits of Type 2 DM Patients on Blood Cholesterol Levels

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ABSTRACT	ARTICLE INFO
<p>Teenagers tend to spend a lot of food at home and often choose fast food. This condition can lead to increased food intake, decreased activity, and increased blood sugar levels. As a result, levels interfere with glucose metabolism. This study aims to see the influence between the habits of type 2 DM patients on cholesterol levels. The research method used was an experiment using quantitative data retrospectively with an observational approach where the sample was selected incidentally and analysed using the SEM method with a total sample of 32 people. The results showed that the variable habits of type 2 DM patients had a P-value below 0.05 on the variable cholesterol levels with indicators of LDL levels and triglyceride levels. The conclusion of this study is that the habits of patients with type 2 diabetes have a significant influence on cholesterol levels.</p>	<p>Article History : Submitted : 7 Des 2024 Accepted : 16 Des 2014 Publication : 31 Des 2024 DOI : http://dx.doi.org/10.46356/jakk.v7i1.326</p> <p>Keyword : Diabetes Mellitus, Cholesterol level, SEM</p>

INTRODUCTION

Restriction of activities outside the home during the pandemic, adolescents and children are at risk of having elevated blood sugar. Almost all activities are done at home due to the limited learning process. Teenagers tend to spend a lot of food at home and often choose fast food. This can lead to increased food intake, decreased activity, and elevated blood sugar levels. As a result, levels interfere with glucose metabolism. The continuous increase in blood glucose leads to an increase in triglycerides, which is often associated with insulin resistance and relative insulin deficiency. (Gumilar, 2022)

Diabetes is one of the non-communicable diseases that cause the highest mortality in Indonesia. In 2019, it was reported that there were about 2 million mortalities due

to diabetes and diabetes-related kidney disease each year (Ministry of Health, 2023). According to the World Health Organisation, almost 80% of people with diabetes mellitus live in low- and middle-income countries, one of which is Indonesia. The International Diabetic Federation (IDF) states that in 2015, 415 million adults were diagnosed with diabetes, a 4-fold increase from 108 million in the 1980s. By 2040 it is estimated that the number will be 642 million people. (WHO, 2021)

Based on epidemiological research of several ethnic groups around the world, race and ethnicity also affect the prevalence of type 2 diabetes mellitus, so we can compare a country or ethnic group whose majority population is white such as Singapore and

Wadena, where the white race is 3-6% higher in prevalence than European countries. The affluence of a country also affects the prevalence of type 2 DM due to lifestyle changes, such as some Micronesian and Polynesian peoples in the Pacific, Pima Indians in the US, Mexicans in the US, Creoles in Mauritius and Suriname, and indigenous Australians. This prevalence is also found in Malta, Saudi Arabia, Indian Canada, Chinese in Mauritius, and Taiwan. (Slamet, 2009)

Diabetes that is not treated properly can cause many problems of vascular complications and neuropathy (ADA, 2021). So it is necessary to carry out regular laboratory examinations, one of the tests recommended by the American Diabetes Association (ADA) for diabetes disease parameters is the HbA1C examination (Association, 2021). Glycaemic control is assessed by A1C measurement, continuous glucose monitoring (CGM), and self blood glucose monitoring (SMBG). A1C is the metric used to date in clinical trials demonstrating the benefits of improved glycaemic control (ADA, 2021). DM patients can know their blood sugar level in the last two to three months by measuring HbA1c, which is the recommended measurement for glycaemic control.

According to the 2013 Basic Health Research report, in the province of South Sumatra the number of people aged ≥ 15 years diagnosed with Diabetes Mellitus was 49,318 out of 5,479,724 people aged ≥ 14 years. As for some of the precipitating factors that cause the risk of diabetes mellitus are; obesity, hypertension, family history of dyslipidemia, age, genetic factors, smoking and alcohol. From Purnamasari's research journal conducted at Pusri Hospital Palembang with the title 'Triglyceride Levels in patients with Type II Diabetes Mellitus at Pusri Hospital Palembang in 2018, showing an increase in Triglyceride levels in patients with type II Diabetes Mellitus which is 65%. (4) The background of this title includes; age, gender, and Body Mass Index.

In Central Java Province, there were 618,546 people with diabetes in 2021, and as

many as 91.5% of them had received medical care in accordance with standards. There are eleven districts and cities that have a 100 per cent percentage of health services for diabetes patients, and the prevalence of Diabetes disease based on diagnosis in Central Java Province, especially in Kudus Regency, reaches 100 new patients a year (Salsabilla & Purwanti, 2021). The increase in diabetes mellitus (DM) cases worldwide is due to many factors, namely: unhealthy lifestyle, diet (Sami et al., 2017), Urbanisation and Environmental Change (Saeedi et al., 2019), and genetics (ElSayed et al., 2023).

METHODS

This study is an experimental study that uses quantitative data collected retrospectively through laboratory results of type 2 DM patients in their medical records with an observational approach. The sample in this study amounted to 32 people with a sampling technique using accidental sampling where anyone the researcher met and was a type 2 DM patient would be selected as a sample. Data analysis using the Structural Equation Modeling method abbreviated as SEM is a multivariate analysis method that can be used to describe the relationship of linear relationships simultaneously between observational variables (indicators) and variables that cannot be measured directly (latent variables) (Prihandini & Sunaryo: 2011) with the help of the SmartPLS application.

Table 1. Activity Schedule

Agenda	Day I	Day II	Day III	Day IV	Day V
Preparation					
Socialisation & Education DM					
Test of DM & TG					
Data collection					
Data entry & coding					
Data analysis					
Interpretation of results					
Report					

RESULTS AND DISCUSSION

This research was carried out on Thursday 11 January 2024 in Southeast Sulawesi Province for 5 days starting with the preparation stage to the reporting stage. This research raises a national and even world issue that is closely related to people's lifestyle habits so that it becomes the forerunner of disease and even disease complications, one of which is diabetes mellitus. Diabetes mellitus is a chronic disease caused by a lack of insulin secretion from pancreatic beta cells, this condition causes high blood sugar levels or hyperglycaemia. Insulin is a hormone consisting of amino acids produced by pancreatic beta cells. Under normal circumstances, insulin is secreted into the blood as needed by the body for blood glucose regulation. Diabetes mellitus is characterised by 3Ps, namely: Polyuria (increased urine output), polydipsi (increased thirst), and polyphagia (increased hunger).



Figure 1. The process of collecting data on respondent identity & blood samples

Dyslipidemia is often found in patients with type 2 diabetes. Dyslipidemia is a disorder of lipid metabolism in the form of increased levels of total cholesterol, triglycerides (TG), low density lipoprotein (LDL), and decreased levels of high density lipoprotein (HDL). The most common features of dyslipidaemia in type 2 DM are increased triglyceride and LDL levels and decreased HDL. The classic symptoms of diabetes are excessive thirst, frequent urination especially at night, eating a lot and rapid weight loss. In addition, sometimes there are complaints of weakness, tingling in the fingers and toes, fast hunger, itching, blurred vision,

decreased sex drive, wounds difficult to heal and mothers often give birth to babies over 4 kg.

Table 2. Characteristics of respondents according to their gender

		Jenis Kelamin			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Laki-laki	8	25.0	25.0	25.0
	Perempuan	24	75.0	75.0	100.0
Total		32	100.0	100.0	

Based on the table above, it explains that the distribution of respondents according to their gender can be explained, namely respondents with male gender were 8 people with a percentage of 25%, while respondents with female gender were 24 people with a percentage of 75%. To see the distribution of data can be seen in the diagram below:

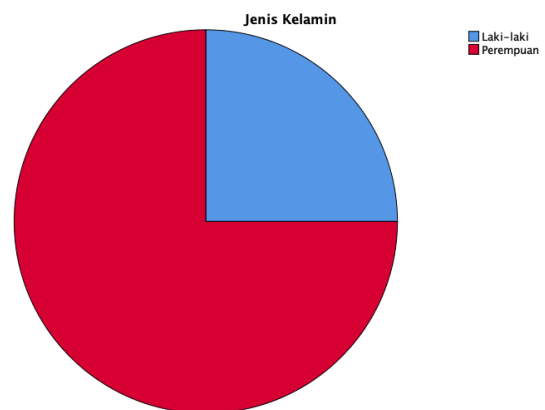


Figure 2. Pie chart of the distribution of respondents according to their gender

It can be seen that the diagram above shows that respondents with type 2 diabetes mellitus are dominated by female gender (see red colour) compared to respondents with male gender (see blue colour). The results of statistical data analysis using the SEM method can be seen in the following section:

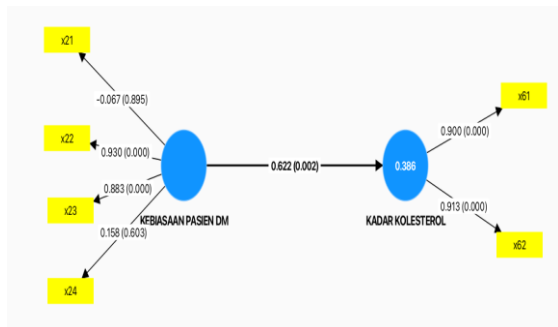


Figure 3. SEM Analysis Model of Research Variables

The figure above explains that the DM PATIENT HABITS variable with indicators of FOOD TYPE (X21), PHYSICAL ACTIVITY (X22), DRINK TYPE (X23), BLOOD SUGAR RATE (X24) has a significant influence on the CHOLESTEROL RATE variable (indicators of LDL / x61 levels and Triglyceride / x62 levels) with a P-value of 0.002 where the X22 indicator is the frequency of exercise. This shows that in their condition the average DM patient rarely exercises so that it has a big impact of up to 93%. This is in line with research conducted by Selviana (2019) which states that most respondents who do not exercise have normal cholesterol levels (70.9%). There is a relationship between sports activity and cholesterol levels ($p=0.051$) with $\alpha=10\%$.

Triglycerides and cholesterol are bound in the blood plasma as plasma lipids containing dietary fat and body fat (carbohydrates). Hypertriglyceridemia is a condition where triglyceride levels are more than 200 mg/dL in the blood of a normal person. In type 2 diabetics, triglycerides impact HbA1c by decreasing insulin function, increasing hormone-sensitive lipase, which causes lipolysis, and the release of fatty acids and glycerol from the blood, leading to an increase in the amount of triglycerides and cholesterol (Hafid & Suharmanto, 2021).

Previous studies researched by Hafid and Suharmanto (2021) showed that there was an interrelation between triglyceride levels and HbA1c of NGSP. However, according to a study conducted by Nainggolan et al (2018), it was found that there was no correlation between triglyceride and HbA1c values (Nainggolan & Wulanjani, 2018). Based on the different results of the two studies conducted previously, as well as the increasing incidence of diabetes to date in the kodus area, especially at the Srikandi Husada Kudus Clinic, so that researchers are interested in conducting research on the interrelation of HbA1c and Triglyceride levels in Type 2 Diabetes Patients at the Srikandi Husada Kudus Clinic.

The results of Sumampouw and Halim's (2019) study showed that factors that increase triglyceride levels are caused by the following aspects: Familial combined hyperlipidemia (FCHL), obesity, hypothyroidism, and the severity of DM, which indicates a correlation between HbA1c and triglycerides. Diabetes caused by insulin resistance can also alter fat metabolism and storage. Under normal circumstances, insulin can increase the amount of free fatty acids into fat tissue cells and prevent lipolysis from occurring. However, free fat in the blood increases in patients with type 2 diabetes, raising the lipid profile and can lead to complications.

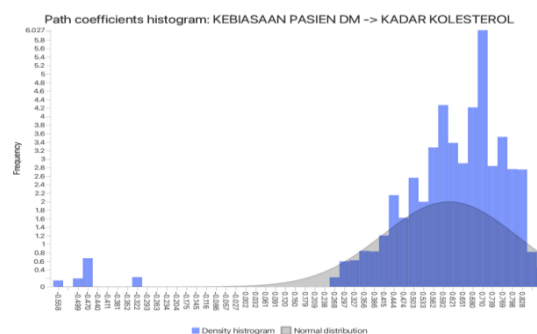


Figure 4. Diagram of Data Normality Test Results

Based on the diagram above, it shows that the data is normally distributed, which means that the data distribution is close to the average value of the data. Apart from that, the curves formed form a bell which also proves that the data is normally distributed.

Table 3. R Square Value

	R-square	R-square adjusted
KADAR	0.386	0.373
KOLESTEROL		

Based on the table shows that the influence of the DM PATIENT FREEDOM variable is 38.6% where 61.4% is influenced by other variables not included in this study. A study conducted by (Hikmah & Oktaviani, 2022) found that there was a significant correlation between fasting blood sugar levels and triglyceride levels in patients suffering from Type II diabetes mellitus. The results of the study (Wang et al., 2022) showed that in patients with type II diabetes mellitus, there was a positive relationship between blood glucose levels and TG and LDL-C levels, as well as higher TG/HDL-C and LDL-C/HDL-C ratios. Meanwhile, a study (Mamay, 2023) found that there was a significant relationship between fasting blood glucose and triglyceride levels in patients with type 2 diabetes mellitus.

CONCLUSION

The results of the study can be concluded that there is a significant influence between the habits of patients with type 2 diabetes mellitus and cholesterol levels.

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