Low density lipoprotein (LDL) in type 2 diabetes mellitus

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ARTICLE INFO	ABSTRACT
	Hyperglycemia due to abnormal insulin secretion, insulin work or both. Type 2 Diabetes Mellitus is the most among other types of diabetes mellitus. Diabetes mellitus is usually accompanied by dyslipidemia. Dyslipidemia is a disorder of lipid metabolism or cholesterol characterized by an increase or decrease in lipid fraction in the plasma. Diabetes mellitus and elevated Low-Density Lipoprotein (LDL) cholesterol levels are often found to be interrelated. The purpose of this study was to describe Low-Density Lipoprotein (LDL) levels in patients with type 2 diabetes mellitus. The research design used was descriptive non-analytic. The population in this study were all patients with type 2 diabetes mellitus using a purposive sampling technique of 30 samples. Data collection was carried out by observing the medical record data of type 2 diabetes mellitus patients with Low-Density Lipoprotein (LDL) profile data for 2017. The results showed that patients with type 2 Diabetes Mellitus suffered the most by male sex with a percentage of 57%, aged over 45 years with a percentage of 97%, and having high LDL levels as much as 40%.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease characterized by higher blood sugar levels (normal), namely blood sugar levels equal to or more than 200 mg/dl, and fasting blood sugar levels in above or equal to 126 mg/dl. DM is known as the silent killer because it is often not realized by the person and now there are complications. DM can attack the entire system of the human body, ranging from the skin to the heart which causes complications.[1]

The state of insulin resistance or metabolic syndrome and type 2 DM causes abnormalities in lipid metabolism which are characterized by an increase or decrease in plasma lipid fraction (dyslipidemia). Dyslipidemia will cause oxidative stress, this condition occurs due to a disruption of lipoprotein metabolism which is often referred to as lipid triads including increased concentrations of Very Low-Density Lipoprotein (VLDL) or triglycerides, decreased concentrations of High- Density Lipoprotein (HDL), and formation of small dense Low Density Lipoprotein (LDL) which is more atherogenic.[2]

Diabetic type 1 Mellitus results from autoimmune dysfunction with a lack of beta cells and idiopathic. Type 2 diabetes mellitus is caused by decreased sensitivity to insulin

(insulin resistance) or due to a decrease in the amount of insulin formation. Gestational Diabetes Mellitus (GDM) is caused by an increase in the secretion of various hormones that have a metabolic effect on glucose tolerance, so pregnancy is a diabetic state.[3] Type 2 diabetes mellitus is the most among the other types of diabetes mellitus. Diabetes mellitus is usually accompanied by dyslipidemia. Dyslipidemia is a disorder of lipid metabolism or cholesterol characterized by an increase or decrease in plasma lipid fraction.[4]

Cholesterol released consists of 2 types, namely HDL cholesterol (High-Density Lipoprotein) and LDL cholesterol (Low-Density Lipoprotein).[5] In type 2 diabetes mellitus (T2DM) occurs Abnormalities caused by insulin resistance that affects the body that occurs due to production and disposal processes plasma lipoprotein. In fat tissue, there is a decrease in the effect of insulin so that lipogenesis decreases and lipolysis increases. This will excrete glucotoxicity due to lipotoxicity which causes an increase in LDL cholesterol levels.[6]

WHO predicts an increasing number of people with diabetes mellitus great for the coming years. For Indonesia, WHO predicts an increase in the numbers of patients from 8.4 million in 2000 to around 21.3 million in 2030.[7] Indonesia is estimated to be ranked 5th in the order of countries with the highest number of people with diabetes mellitus by 2025. Professionals state that type 2 diabetes mellitus in Indonesia reaches 85-90% of total diabetes.[8]

The prevalence of diabetes mellitus in Indonesia is occupied by the East Java province because Diabetes Mellitus is the top 10 most diseases. High cases of diabetes mellitus in 2013 had a prevalence rate of 2.1% in Surabaya and this figure was higher than the prevalence of diabetes mellitus in Indonesia, which was 1.5%.[9] Based on the current population growth pattern, it is estimated that in 2020 there will be 178 million people aged over 20 years and with the assumption of a DM prevalence of 4.6% there will be 8.2 million diabetic patients.[10] Hypercholesterol is a condition where cholesterol levels in the body exceed normal conditions Hypercholesterol can increase the risk of atherosclerosis, coronary heart disease, pancreatitis (inflammation of the pancreatic organs), diabetes mellitus, thyroid disorders, liver disease & kidney disease.[11]

The cholesterol level that is often found in people with diabetes mellitus is an increase in triglyceride levels and a decrease in HDL levels, while LDL levels are normal or slightly increased. There is a direct relationship between an increase in serum cholesterol levels and a decrease in insulin secretion, so a lipid profile is needed at the time of diagnosis of diabetes. Lipid profile examination is done at least once a year and if deemed necessary it can be done more frequently whereas in patients who examine lipid profiles show good results the examination can be done every 2 years.[12]

MATERIALS AND METHODS

This study uses Descriptive Non-Analytical methods. The type of research is the Case-Control study. The population of this study was all patients with Diabetes Mellitus in the Era Medika Tulungagung Hospital in 2017. The sample of this study was 30 Diabetes Mellitus Type 2 patients at Era Medika Tulungagung Hospital in 2017. In this study, the data taken came from patients' medical records when they were treated at the General Polyclinic of Era Medika Tulungagung Hospital in 2017. Data collection was conducted after obtaining permission from medical records. Data analysis in this study includes editing, coding, and tabulation in the table model.

RESULTS AND DISCUSSION

Based on the results of research conducted on LDL levels in type 2 Diabetes Mellitus patients the following results were obtained :

Table 1. Characteristics of Type 2 Diabetes Mellitus Patients by Gender

No	Gender	Amount	Percentage (%)
1	Man	17	57%
2	Woman	13	43%
	Total	30	100%

In table 4.1 shows that the characteristics of type 2 Diabetes Mellitus patients based on sex with the highest number are men who have a percentage of 57% compared to women, namely 43%. Gender is a risk factor for the occurrence of DM that cannot be modified[13]. Other factors associated with diabetes risk are those with metabolic syndrome, sufferers of cardiovascular disease history, alcohol consumption, stress factors, gender, coffee consumption and caffeine[14,15]. This is because men are more physically active compared to women. Physical activity can increase insulin sensitivity[16]. In men, an increase in LDL levels tends to increase with constant HDL levels[17]. This study is in line with the percentage of respondents who took part in the study with male sex (51%) compared to women (49%)[18]. These results are also in accordance with the existing theoretical basis and previous research that there is a higher increase in levels HbA1c, LDL, HDL in men compared to women, while an increase in women was higher than men in total cholesterol, triglycerides and fasting blood sugar[1].

Table 2. Characteristics of Type 2 Diabetes Mellitus Patients by Age

No	Age	Amount	Percentage (%)
1	<45	1	3%
2	>45	29	97%
	Total	30	100%

In table 4.2 shows that the characteristics of patients with type 2 diabetes mellitus based on the age with the highest number, namely age> 45 years with a percentage of 97% compared to age <45 years, which is only 3%. According to the American Diabetes Association (ADA) that DM is associated with irreversible risk factors including family history with DM (first degree relative), age ≥45 years, ethnicity, childbirth history with a baby's birth weight> 4000 grams or history of having suffered Gestational diabetes and a history of birth with a low weight (<2.5 kg)[14]. This study is in line with Josten et al's research that the most age who experienced dyslipidemia in both men and women were the age group> 59 years so that there was a significant relationship in the age group over 45 years who were more at risk of developing type 2 diabetes[19]. One of the risk factors for DM disease is a person over 45 years of age and is characteristic of Type 2 DM, so it is recommended for every person aged 45 years and over to check their blood glucose levels[7,20,21]. In general, the age of ≥ 45 years has a risk of suffering from type 2 diabetes due to a decrease in metabolic processes. Along with increasing age, a person will experience slump both physically and psychologically which will then affect the emergence of various kinds of complications[13]. The higher the age of type 2 DM patients, the higher the blood glucose level due to impaired glucose tolerance[22]. According to WHO when it reaches the age of 30 years, blood glucose levels will rise 1-2 mg/dl/ year when fasting and when 2 hours after eating will increase by about 5, 6-13 mg/dl. So from that age is one of the most important factors in the occurrence of Diabetes Mellitus[17]. It can be concluded that the majority of respondents who suffer from type 2 DM are between 45-60 years old or in the adult category. Adult age is a pre-elderly age, where function and integration begin to decline, the ability to mobilize and activities has begun to decrease so that several diseases appear that cause health status to decline.[1]

Table 3. LDL Distribution of Type 2 Diabetes Mellitus Patients

No	Category	Reference Value (mg/dl)	Amount	Percentage (%)
1	Normal	<130 mg/dl	8	27%
2	High Limit	130-159 mg/dl	10	33%
3	High	>160 mg/dl	12	40%
Total			30	100%

In Table 4.3 shows that the distribution of LDL levels of patients with type 2 Diabetes Mellitus with a normal category of 8 (27%) patients, a high limit category of 10 (33%) patients, and a high category of 12 (40%) patients. From these data, it is known that there is an increase in the number of patients in each category. Where in patients with type 2 diabetes mellitus who have high LDL levels will accelerate the occurrence of atherosclerosis. Some studies show that LDL levels in type 2 Diabetes Mellitus patients are significantly higher and become markers of coronary artery disease and acute coronary syndrome. Another study reported that LDL cholesterol levels were also higher in patients with diabetes mellitus with hypertension compared with patients with diabetes mellitus without hypertension and significantly contributed to the incidence of hypertension[23]. This study is in line with Novianti et al (2015), namely the results of an examination of LDL cholesterol levels in 25 samples of type 2 non-CHD diabetes mellitus patients with 9 (18%) patients with normal LDL cholesterol and 16 (32%) patients with LDL cholesterol levels not normal or increased[6].

CONCLUSIONS

The conclusion of the study "Analysis of LDL Levels in Patients with Type 2 Diabetes Mellitus in Era Medika Tulungagung Hospital" was male subjects (57%), aged> 45 years (97%), and had high LDL levels (40%) so that it shows one of the factors that affect LDL levels, namely age> 45 years.

ACKNOWLEDGMENT

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