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Triglycerides and Cardiovascular Risk: A cross-sectional study

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Keywords:
Framingham risk score, triglycerides

ABSTRACT

Cardiovascular disease is one of the leading causes of death worldwide. Dyslipidemia in obesity is very typical, namely the occurrence of a large and rapid increase in the lipid profile, especially triglycerides (TG). most commonly used is the FRS risk score (Framingham Risk Score)., this study wanted to determine triglycerides and cardiovascular risk. This type of research was a cross-sectional research design. The research location used in this study is around the Surabaya area starting in March-July 2022. The research location was carried out in a hospital in Sidoarjo, East Java, Indonesia. The number of respondents involved in the study were 44 people. Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%). The average respondent's TG value was 139.05 mg/dL. Most respondents had a normal TG level with high level of FRS (17 of 44). And there was no significant relationship between TG and FRS. Need further research that affects TG and FRS due to other factors.

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1. INTRODUCTION

Obesity is one of the main health problems in almost the world and every year there is always an increase in morbidity and mortality [1]. Obesity has developed into an epidemic, with more than 4 million deaths annually. The number of people who are obese continues to increase every year, from 1975 it has tripled to 2016. In 2016 more than 1.9 billion adults, aged 18 years and over, were overweight and obese, of the total 650 cases. million of them are obese [2].

Obesity is an excessive accumulation of fat due to an imbalance between energy intake and energy expenditure for a long time. Obesity is also an important risk factor for coronary heart disease, hypertension, cerebrovascular disease and dyslipidemia [3], [4]. Obesity has a strong relationship with the occurrence of dyslipidemia caused by a significant increase in lipid profile due to an imbalance in intake and expenditure intake, and the fact that around 60-70% of obese people have dyslipidemia [1], [5]. The increased risk of cardiovascular disease in obese patients is largely due to dyslipidemia. More than 50% of obese patients will

develop dyslipidemia [5], [6], and dyslipidemia in obesity is very typical, namely the occurrence of a large and rapid increase in the lipid profile, especially triglycerides (TG) [5], [7].

Metabolic syndrome is closely related to atherosclerosis. Atherosclerosis, is the leading cause of heart disease and stroke, and the leading cause of approximately 50% of all deaths. Epidemiological studies have revealed several important environmental and genetic risk factors associated with atherosclerosis. and thrombosis [8], [9]. Cardiovascular disease is one of the leading causes of death worldwide. A number of population-based studies from low-income countries have shown that socio-demographic characteristics are associated with cardiovascular disease, with increasing age, female sex and lower education consistently being associated with a higher prevalence of cardiovascular disease [10]. Primary prevention of cardiovascular disease has been carried out on risk factor identification and treatment without any attempt to identify cardiovascular disease early. The screening tests used are effective in revealing cardiovascular disease early so that targeted treatment can be effective in reducing the incidence of cardiovascular events in susceptible individuals. Documentation of the sensitivity and specificity of this approach requires a longitudinal study [11]. In people with obesity, metabolic abnormalities generally occur which are associated with increased visceral fat, increased triglycerides and decreased High Density Lipoprotein (HDL) values [5], therefore triglycerides can be one of the clinical signs of obesity. Increased triglyceride values can also be influenced by several factors such as food intake, physical activity [12], [13].

Triglycerides are non-polar lipid molecules consisting of a glycerol molecule bound to three fatty acid molecules, namely saturated fat, unsaturated fat and polyunsaturated fat and are used by the body as an energy source and to form cell membranes. Lipids or triglycerides have three metabolic pathways in the body, namely the exogenous pathway, the endogenous pathway where these two pathways have a relationship with lipid and lipoprotein metabolism and the reverse cholesterol transport pathway associated with High Density Lipoprotein (HDL) metabolism [14], [15]. In the exogenous pathway, TG is a form of Fat absorbed by the intestine after hydrolysis is then converted into chylomicrons and then transported by lipoprotein apolipoprotein B-48 (apoB-48), while in the endogenous pathway, TG is produced by the liver in the form of Very Low Density Lipoprotein (VLDL) which is metabolized by apolipoprotein B [16], [17].

There are several ways to perform a risk factor assessment. The most commonly used is the FRS risk score (Framingham Risk Score) and in European countries the Systematic Coronary Risk Estimation (SCORE) was used [18], [19]. The result is a calculation of the risk of atherosclerotic cardiovascular disease in the next 10 years. Therefore, this study wanted to determine triglycerides and cardiovascular risk.

2. METHODS

2.1 Research design

This type of research was a cross-sectional research design. The research location used in this study is around the Surabaya area starting in March-July 2022. The research location was carried out in a hospital in Sidoarjo, East Java, Indonesia. Ethical test No. 42/KE/IV/2022 in Universitas Surabaya.

2.2 Research variable

Research variables in this study included: triglycerides and cardiovascular risk. Examination of TG levels was carried out using the LipidPro™ tool. The LipidPro™ system consists of a meter and test strip. The detection method on the lipid pro tool uses spectrophotometry and auto coding from the RFID tag. Cardiovascular risk was assessed from the Framinghan Risk Score.

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2.3 Population and Research Sample

The population was all patients with at least three of the five conditions, namely hypertension, hypercholesterolemia, high triglycerides, diabetes, and obesity (BMI 25kg/m2). Samples of patients who met the criteria, among others: age 18-60 years and willing to follow all research procedures. The sample size in this study was calculated based on the formula: n=N/[(1+N)/e2]. Information: n=number of samples needed in the study; N=number of a population; e=error rate of the sample in the study (5%). Then the minimum number of samples was 31 people. The sampling technique used purposive sampling.

2.4 Research Methods and Analysis

Subjects who met the criteria were then asked to fill out an informed consent. Subjects assessed the risk of cardiovascular disease with the Framingham Risk Score (FRS) [18], [19]. The relationship between the risk of cardiovascular disease with triglycerides with Rank Spearman (ordinal data scale).

3. RESULTS

The number of respondents involved in the study were 44 people. Most of the respondents were male (86.36%). The highest age range was early senior as many as 13 people (29.55%). All respondents had a BMI above normal and the majority were obese (70.45%), with an average of 31.36 kg/m^2. Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%) (Table 1).

Table 1: Characteristics of Respondents

Characteristics	N (44)	%
Gender		
Male	5	11.36
Female	39	88.63
Age (years)		
Late adolescence (17-25)	7	15.91
Early adulthood (26-35)	12	27.27
Late adulthood (36-45)	12	27.27
Early seniors (46-55)	13	29.55
Average	36.33	
BMI (body mass index)		
Overweight (23.0-29.9)	13	29.55
Obesity (≥30)	31	70.45
Average	31.36	
FRS (%)		
High (≥20)	27	61.36
Intermediate (10-19)	17	38.63
Low (<10)	0	0.00

Table 2: Cross Tabulation between BMI and HDL Level with Cardiovascular Risk

		Framingham Risk Score (FRS)		TOTAL
		High (≥20)	Intermediate (10-19)	
TG (mg/dL)	severe (>1,000)	0	0	0
	Moderate (150-1,000)	10	3	13
	normal (<150)	17	14	31
	TOTAL	27	17	44

The cross tabulation between TG level with cardiovascular risk can be seen in Table 2. The average respondent's TG value was 139.05 mg/dL. Most respondents had a normal TG level with FRS including high, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.198 (p>0.005), which there was

no significant relationship between TG and FRS.

4. DISCUSSION

Most of the respondents are male. Elevated serum uric acid is commonly associated with high triglyceride. However, the relation of triglyceride and hyperuricemia in different gender and age groups is currently not well understood. Hyperuricemia is widely considered as a key risk factor for metabolic syndrome, including dyslipidemia, in which hypertriglyceridemia is the most common lipid abnormality [20], [21].

All respondents had a BMI above normal and the majority were obese (70.45%), with an average of 31.36 kg/m2. Not all obese individuals are hypertriglyceridemic, but there is a significant correlation between obesity and plasma triglycerides, with heavier individuals having higher triglyceride levels. Triglyceride levels correlate more closely with waist circumference (abdominal obesity) than with body mass index -- atherogenic dyslipidemia (ie, hypertriglyceridemia with low high-density lipoprotein [HDL] cholesterol) is a key feature of the metabolic syndrome [22]. Aerobic exercise, which has been shown to have beneficial effects on plasma lipids, has been recommended as an effective measure to improve the prognosis of individuals with coronary heart disease (CHD). Apolipoprotein C3 (apoC3) is associated with hypertriglyceridemia and is therefore closely related to CHD [23].

Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%). Most respondents had a normal TG level with FRS including high, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.198 ($p>0.005$), which there was no significant relationship between TG and FRS. Triglycerides (TGs) are now considered an independent risk factor for cardiovascular disease (CVD). When TGs are elevated, lipoprotein metabolism is altered, which increases CVD risk. Patients with elevated TGs and low high-density lipoprotein are at particularly high risk of CVD [24], [25].

5. CONCLUSION

The average respondent's TG value was 139.05 mg/dL. Most respondents had a normal TG level with high level of FRS (17 of 44). And there was no significant relationship between TG and FRS.

6. ACKNOWLEDGMENTS

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7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

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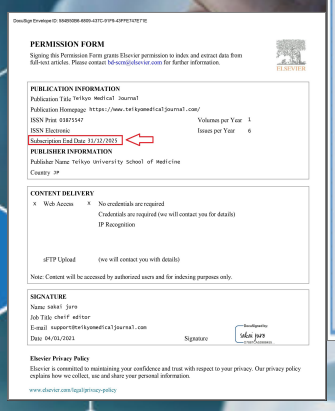
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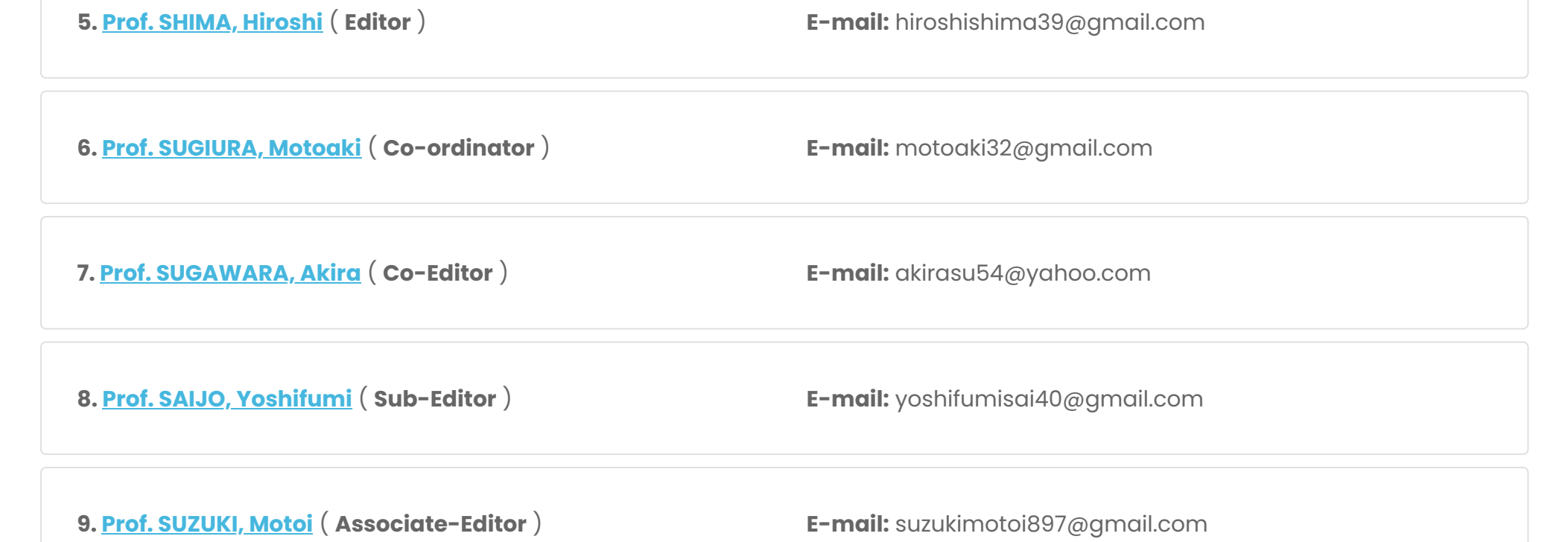

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by Amelia Lorensia

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Early adulthood (26-35)	12	27.27
Late adulthood (36-45)	12	27.27
Early seniors (46-55)	13	29.55
Average	36.33	
BMI (body mass index)		
Overweight (23.0-29.9)	13	29.55
Obesity (≥30)	31	70.45
Average	31.36	
FRS (%)		
High (≥20)	27	61.36
Intermediate (10-19)	17	38.63
Low (<10)	0	0.00

Table 2: Cross Tabulation between BMI and HDL Level with Cardiovascular Risk

		Framingham Risk Score (FRS)		TOTAL
		High (≥20)	Intermediate (10-19)	
TG (mg/dL)	severe (>1,000)	0	0	0
	Moderate (150-1,000)	10	3	13
	normal (<150)	17	14	31
	TOTAL	27	17	44

The cross tabulation between TG level with cardiovascular risk can be seen in Table 2. The average respondent's TG value was 139.05 mg/dL. Most respondents had a normal TG level with FRS including high, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.198 (p>0.005), which there was

no significant relationship between TG and FRS.

4. DISCUSSION

Most of the respondents are male. Elevated serum uric acid is commonly associated with high triglyceride. However, the relation of triglyceride and hyperuricemia in different gender and age groups is currently not well understood. Hyperuricemia is widely considered as a key risk factor for metabolic syndrome, including dyslipidemia, in which hypertriglyceridemia is the most common lipid abnormality [20], [21].

All respondents had a BMI above normal and the majority were obese (70.45%), with an average of 31.36 kg/m2. Not all obese individuals are hypertriglyceridemic, but there is a significant correlation between obesity and plasma triglycerides, with heavier individuals having higher triglyceride levels. Triglyceride levels correlate more closely with waist circumference (abdominal obesity) than with body mass index.-atherogenic dyslipidemia (ie, hypertriglyceridemia with low high-density lipoprotein [HDL] cholesterol) is a key feature of the metabolic syndrome [22]. Aerobic exercise, which has been shown to have beneficial effects on plasma lipids, has been recommended as an effective measure to improve the prognosis of individuals with coronary heart disease (CHD). Apolipoprotein C3 (apoC3) is associated with hypertriglyceridemia and is therefore closely related to CHD [23].

Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents was high (61.36%) and intermediate (38.635%). Most respondents had a normal TG level with FRS including high, which was 17 of 44. Based on the correlation test with sig. (2-tailed) was 0.198 (p>0.005), which there was no significant relationship between TG and FRS. Triglycerides (TGs) are now considered an independent risk factor for cardiovascular disease (CVD). When TGs are elevated, lipoprotein metabolism is altered, which increases CVD risk. Patients with elevated TGs and low high-density lipoprotein are at particularly high risk of CVD [24], [25].

5. CONCLUSION

The average respondent's TG value was 139.05 mg/dL. Most respondents had a normal TG level with high level of FRS (17 of 44). And there was no significant relationship between TG and FRS.

6. ACKNOWLEDGMENTS

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7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

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