Association of HDL profile with cardiovascular risk factors in metabolic syndrome patients

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ABSTRACT

Cardiovascular disease is the number one cause of death in Indonesia. The increased risk of cardiovascular disease in obese patients is largely due to dyslipidemia. One of the important lipid profiles to observe is HDL. One form of early prevention that can be done is to predict the risk of cardiovascular disease in the future. The research wanted to determine the relationship of HDL profile with cardiovascular risk factors in patients with metabolic syndrome. The research design was cross sectional. The research location used in this study is around the Surabaya area starting in March-June 2022. The research location was carried out in Rungkut District, Surabaya, Indonesia. The variables of this study were the risk of cardiovascular disease and HDL levels. Samples of patients at Siti Khodijah Throughout Hospital who met the criteria, among others: age 18-60 years and willing to follow all research procedures. The sampling technique used was purposive sampling. 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). Test the relationship between the risk of cardiovascular disease with HDL levels with Rank Spearman. The number of respondents involved in the study were 37 people. Most of the respondents have low HDL scores and high cardiovascular risk (12 people). The value of the Spearman correlation coefficient was 0.897, indicating that there was a relationship between the HDL profile and cardiovascular risk of 89.7%. The relationship between HDL profile with cardiovascular risk was strong, HDL values will be associated with cardiovascular risk. Therefore, a patient with the metabolic syndrome should paid more attention to the HDL value to prevent cardiovascular-related comorbidities.

Keywords: Framingham risk score; HDL; metabolic syndrome

BACKGROUND

In the modern era, there is a change in people's consumption patterns which have an impact on increasing the prevalence of cardiovascular disease and the high cost of treatment due to cardiovascular disease which continues to increase [1]. Based on the World Health Organization (WHO) 2018, cardiovascular disease is the number one cause of death in Indonesia with a percentage of 35% in 2016 [2]. Metabolic syndrome is a group of metabolic abnormalities in an individual that are associated with an increased risk of cardiovascular disease. The prevalence of metabolic syndrome is increasing rapidly every year. Epidemiological data say the prevalence of the world metabolic syndrome is 20-25% [3].

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 [4]. 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 [5]. 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 [6,7].

The increased risk of cardiovascular disease in obese patients is largely due to dyslipidemia. More than 50% of obese patients will develop dyslipidemia [8]. One of the important lipid profiles to observe is HDL. HDL has an important role as atheroprotection. HDL has an important role in the process of reverse cholesterol transport (RCT). HDL can independently predict cardiovascular disease and every 1 mg/dL decrease in HDL can lead to a 3–4% increase in risk [9].

For someone who already has risk factors but has never experienced cardiovascular disease, in this case an asymptomatic patient, early prevention is needed. One form of early prevention that can be done is by predicting the risk of cardiovascular disease in the future. 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 [10,11]. The result is a calculation of the risk of atherosclerotic cardiovascular disease in the next 10 years. In this study, the FRS calculation method was used, which is one of the calculations to determine the classic risk factors for cardiovascular disease such as age, gender, hypertension, diabetes mellitus, smoking, obesity, physical activity and blood cholesterol levels [10,11]. Therefore, this study wanted to determine the relationship of HDL profile with cardiovascular risk factors in patients with metabolic syndrome.

METHODS

Research Design

The research design was cross sectional. The research location used in this study was around the Surabaya area starting in March-June 2022. The research location was carried out in Rungkut District, Surabaya, Indonesia.

Research variable

The variables of this study were the risk of cardiovascular disease and HDL levels. Metabolic syndrome was a group of health disorders that occur together. A person was said to have metabolic syndrome if he experiences at least three of the five conditions, namely hypertension, hypercholesterolemia, high triglycerides, diabetes, and obesity. Cardiovascular risk and atherosclerosis were assessed from the Framinghan Risk Score.

Population and 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 at Siti Khodijah Throughout Hospital 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 is 31 people. The sampling technique used was purposive sampling.

Data Collection and Analysis Method

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). Test the relationship between the risk of cardiovascular disease with HDL levels with Rank Spearman (ordinal data scale).

RESULTS AND DISCUSSIONS

The number of respondents involved in the study were 37 people. Most of the respondents were male (91.89%). The highest age range is early adulthood as many as 13 people (35.14%) and late adulthood as many as 13 people (35.14%), with an average of 36.71 years. All respondents had a BMI above normal and the majority were obese (72.97%). HDL values that were below the normal range were 19 people (51.35%). Cardiovascular risk with the FRS (Framingham risk score) assessment from the respondents is high (54.05%) and intermediate (45.95%) (**Tabel 1**).

One of the proatherogenic effects of obesity is dyslipidemia and more than 50% of obese patients will experience dyslipidemia. This will affect the risk of cardiovascular disease which continues to increase in obese patients [8]. The prominent dyslipidemia in obesity is low HDL levels [12]. Indonesia is one of the countries in Asia Pacific which ranks 3rd with an HDL value <40 mg/dL with a prevalence of 23-66% [13]. The binding of cardiovascular risk in patients with metabolic syndrome was exacerbated by the sedentary lifestyle of today's society, such as low physical activity [14,15], smoking habits [16], and weight gain [17].

Food intake can cause varied responses to plasma lipid levels between individuals caused by genetic factors [18,19]. One of the important genes in lipid homeostasis is Peroxisome Proliferator Activated Receptor Alpha (PPAR-α). PPAR-α is one of the important genetic factors because it has a function as a major regulator of fatty acid metabolism, lipoproteins, and energy balance [20]. PPAR-α activation can be carried out by natural and synthetic ligands. PPAR-α activation using synthetic ligands (fibrates) to increase HDL efficiently is still limited [21].

The cross tabulation between HDL level and cardiovascular risk can be seen in **Table 2**. Most of the respondents have low HDL scores and high cardiovascular risk (12 people) (**Table 2**). The value of the Spearman correlation coefficient was 0.897, indicating that there was a relationship between the HDL profile and cardiovascular risk of 89.7%. The relationship between HDL profile with cardiovascular risk was strong, HDL values will be associated with cardiovascular risk.

Previous research, demonstrated that HDL function plays a much more important role in atheroprotection than HDL-C levels. Plasma HDL is a heterogeneous group of particles with diverse structures and biological activities, and very high levels of HDL-C are not always protective. HDL functionality depends on genetic, environmental, and lifestyle factors and can be modified in several disease states. Increases HDL functionality and potentially reduces cardiovascular risk [22]. In addition, other studies that also support the relationship between HDL levels and cardiovascular risk, namely the Framingham study and other studies that followed it could show that HDL-C is an independent cardiovascular risk factor and that elevated HDL-C [23].

CONCLUSION

There was a strong relationship between HDL profile with cardiovascular risk factors in metabolic syndrome patients. Therefore, a patient with the metabolic syndrome should paid more attention to the HDL value to prevent cardiovascular-related comorbidities.

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Tabel 1. Characteristics of respondents

Characteristics	N (37)	%
Gender		
Male	34	91.89
Female	3	8.11
Age (years)		
Late adolescence (17-25)	4	10.81
Early adulthood (26-35)	13	35.14
Late adulthood (36-45)	13	35.14
Early seniors (46-55)	7	18.92
Average	36.71	
BMI (body mass index)		
Overweight (23.0-29.9)	10	27.03
Obesity (≥30)	27	72.97
Average	32.20	
HDL Level (mg/dL)		
Normal (45-60)	18	48.65
Low (>45)	19	51.35
Average	45.45	
FRS (%)		
High (≥20)	20	54.05
Intermediate (10-19)	17	45.95
Low (<10)	0	0.00

Table 2. Cross Tabulation between HDL Level and Cardiovascular Risk

HDL Level (mg/dL)	Framingham Risk Score (FRS)		TOTAL
	High (≥20)	Intermediate (10-19)	
Normal (45-60)	8	10	18
Low (>45)	12	7	19
TOTAL	20	17	37