



Relationship between Plasma Atherogenic Index and Degree of Stenosis in Stable Coronary Heart Disease Patients in Hospital M. Djamil Padang Hospital in 2021-2022

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ABSTRACT

Background: Dyslipidemia is the main risk factor for CHD besides other factors. Dyslipidemia is a lipid metabolism disorder characterized by increased total cholesterol levels, increased triglyceride levels, increased LDL levels, and decreased HDL cholesterol levels. Lipid profile ratios are an alternative to routine tests such as the plasma atherogenic index (IAP) to assess the severity of coronary heart disease. Objective: To determine the relationship between the Plasma Atherogenic Index (IAP) value and the degree of stenosis in patients with stable coronary heart disease at the M. Djamil Hospital in Padang in 2021-2022. Methods: The scope of this research is heart disease and clinical pathology. The research was conducted in April- May 2024. The type of research is descriptive. The population covered in the study were all patients with stable coronary heart disease at the M. Djamil Hospital in Padang in 2021-2022 with a diagnosis of stable angina pectoris, a total of 54 samples using the sequential sampling technique. Univariate data analysis is presented in the form of a frequency distribution and bivariate analysis using the chi-square test, data processing using the computerized SPSS program IBM version 25.0. Results: The highest age was middle adulthood, namely 34 people (63.0%), the highest family history was none, namely 34 people (63.0%), the highest plasma atherogenic index was moderate, namely 30 people (55.6%), the degree Most stenosis was low- moderate, namely 34 people (63.0%) and there was a relationship between the Plasma Atherogenic Index (IAP) and the degree of stenosis in CHD patients at RSUP Dr. M. Djamil Padang in 2021-2022 ($p=0.000$). Conclusion: It is proven that there is a relationship between the Plasma Atherogenic Index (IAP) and the degree of stenosis in CHD patients at RSUP Dr. M. Djamil Padang in 2021-2022.

Keywords: Age, Family-History, Plasma-Atherogenic Index, Degree of Stenosis, Coronary Heart Disease

INTRODUCTION

Cardiovascular disease occurs due to disorders of the heart and blood vessels.

Diseases in cardiovascular disease one of them is Coronary Heart Disease (CHD).⁽¹⁾

Coronary Heart Disease is caused by narrowing of the coronary arteries



caused by the process of atherosclerosis or spasm.⁽²⁾ Atherosclerosis is the hardening and narrowing of the arteries caused by fat deposits, so that arterial vessels are found to be ⁽³⁾

Coronary heart disease is the number one deadly disease in Indonesia, there are more than 2 million cases per year of people suffering from this disease ⁽⁴⁾ Indonesian Health Survey 2023 said coronary heart disease in West Sumatra there are 18,138 sufferers.⁽⁵⁾ WHO estimates that in 2020 the mortality rate in cases of cardiovascular disease will experience increase to 25%, especially in developing countries.⁽⁶⁾ WHO data 2021 deaths from coronary heart disease represent 32% of all deaths globally. Of these deaths, 85% are caused by heart attacks. More than three a quarter of deaths occurred in low-and middle-income countries.⁽⁷⁾ Data from the Ministry of Health, in 2023 shows that the death rate of heart disease in Indonesia 650,000 people a year. ⁽⁸⁾

Many risk factors that cause a person to be exposed Coronary Heart Disease . The risk factors are divided into 2, which can be changed and cannot be changed. Risk factors that can be changed are hypercholesterolemia, smoking, lack of exercise, hypertension, stress, and obesity, while risk factors that can not be changed are age, sex, and hereditary factors.⁽²⁾

Coronary heart disease (CHD) can be diagnosed by doing coronary angiography examination. This examination is an examination gold standard in the CHD pasein. This examination by assessing degrees of coronary artery stenosis is based on the percentage of stenosis. CHD can be said to be significant when degree of stenosis >50% in one main epicardial coronary artery.⁽⁹⁾

Dyslipidemia is a major major risk factor for CHD in addition to other factors. Dyslipidemia is a disorder of lipid metabolism that characterized by increased levels of total cholesterol, increased levels of triglyceride levels, increased LDL levels, and decreased HDL cholesterol levels. decreased HDL cholesterol levels. Ratio lipid profile is an alternative to routine tests such as the atherogenic plasma (IAP) to assess the severity of heart disease coronary heart disease.⁽¹⁰⁾ Plasma atherogenic index (IAP) is a new index that composed of triglycerides and cholesterol high-density lipoprotein, used to measure blood lipid levels.⁽¹¹⁾ In brief, IAP is the logarithm of triglyceride/HDL cholesterol (TG/HDL), which is a biomarker of atherosclerosis.⁽¹²⁾ Some research have proven that IAP plays a role as a predictive value of atherosclerosis, and can be used as a strong predictor index to assess risk factors. to assess risk factors for heart disease.⁽¹³⁾ IAP will increase in individuals who have a high risk of coronary heart disease.⁽¹⁰⁾

Based on the above background CHD is the number one deadly disease in Indonesia, and its cases continue to increasing every year. Research on the relationship between IAP with the degree of stenosis in CHD patients has not been done much. Therefore, researchers are interested in studying the correlation of IAP with the degree of stenosis in coronary heart disease patients at M. Djamil Hospital Padang.

RESEARCH METHODS

Research includes heart disease and clinical pathology. This research conducted at M. Djamil Hospital Padang and the research has been conducted April 2023 to June 2024. The type of research used is descriptive analytic with cross

sectional approach. Target population study were all patients with coronary heart disease patients stabilized at M. Djamil Hospital Padang. Affordable population in research are all patients patients with stable coronary heart disease at M. Djamil Padang hospital in 2021-2022 with a diagnosis of stable angina pectoris. Sampling in this study was selected by consecutive sampling, namely the selection of samples selected based on inclusion and exclusion criteria. based on inclusion and exclusion criteria. In this study, data analysis was carried out by computer using the method descriptive statistics on univariate analysis and Chi-Square test on bivariate analysis.

RESULTS AND DISCUSSION

Table 1 Frequency Distribution of Characteristics of Stable Coronary Heart Disease Patients at M. Djamil Padang Hospital in 2021-2022 Based on Age and Family History.

Characteristics	<i>f</i>	%
Age:		
Middle adulthood	34	63,0
Advanced adult	20	37,0
Family History :		
Yes	20	37,0
None	34	63,0
Total	54	100,0

Based on table 1, it can be concluded that of the 54 respondents, the highest age was middle adulthood, namely 34 people (63.0%) and advanced adulthood 20 people (37%). The most family history is none, namely 34 people (63.0%) and there is a family history, namely 20 people (37%).

Table 2 Frequency Distribution of Plasma Atherogenic Index (IAP) Values in CHD Patients at Dr. M. Djamil Hospital Padang in 2021-2022

Plasma Atherogenic Index	<i>f</i>	%
Low	3	5,6
Medium	30	55,6
High	21	38,9
Total	54	100,0

Based on table 2, it can be concluded that of the 54 respondents, the highest plasma atherogenic index was moderate, namely 30 people (55.6%), low 3 people (5.6%) and high 21 people (38.9%).

Table 3 Frequency Distribution of Stenosis Degree in CHD Patients at Dr. M. Djamil Padang Hospital in 2021-2022

Degree of Stenosis	<i>f</i>	%
Low-Medium	34	63,0
Heavy	20	37,0
Total	54	100,0

Based on table 3, it can be concluded that of the 54 respondents, the highest degree of stenosis was low-moderate, namely 34 people (63.0%) and 20 people (37%) were severe.

Table 4 Relationship between Plasma Atherogenic Index (IAP) and Degree of Stenosis in CHD Patients at Dr. M. Djamil Hospital Padang in 2021-2022

Indeks Aterogenik Plasma (IAP)	Derajat Stenosis						P value
	Low-Medium		Weight		Total		
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
Low-medium	33	61,1	0	0	33	61,1	0,000
High	1	1,9	20	37	21	38,9	
Total	34	63,0	20	37,0	54	100,0	

Based on table 4, it can be concluded that of the 54 respondents, the low-moderate degree of stenosis had a low-moderate IAP category as well, namely (61.1%). The results of statistical tests using the chi square test obtained a value of $p = 0.000$ ($p < 0.05$), which means that there is a relationship between the Plasma Atherogenic Index (IAP) and the degree of stenosis in CHD patients at Dr. M. Djamil Padang Hospital in 2021-2022.

DISCUSSION

A. Age

Based on the results of the study of 54 respondents, the highest age was middle adulthood (41-60 years), with age > 45 years, namely 34 people (63.0%) in stable coronary heart disease patients at M. Djamil Hospital Padang in 2021-2022. The results of this study are in line with previous research conducted by Saleh in 2022 at Dr. H. Chasan Boesoirie Ternate Hospital, obtained the results of research on the most patients at the age of 45-64 years, namely 64 patients (55.7%), and also in line with Fahriza's research in 2023 at the Haji Adam Malik Medan Central General Hospital 2022, obtained the results of research on the age of the most patients is 48-56 years, namely (41.7%).^{(14),(15)}

Tappi in 2022 at the Public Service Agency of the Prof. Dr. R. D. Kandou Manado Central General Hospital, it was found that the age of most CHD patients was 61-70 years, namely (35.4%).⁽¹⁶⁾ The existence of age differences in this study can be caused by the physical activities carried out by patients. Sayfrul et al said physical activity affects the incidence of coronary heart disease, where someone who is not physically active properly will be more at risk of developing CHD compared to someone who is physically active properly. Regular physical activity or by exercising regularly can have the effect of increasing blood flow and helping to break down fat and cholesterol metabolism so that the incidence of CHD can be prevented at a

younger age and seen at an older age.⁽¹⁷⁾

Age affects the risk of developing cardiovascular disease, as age causes changes in the heart and blood vessels. As age increases a person is more susceptible to coronary heart disease, but rarely causes serious illness before the age of 40 years and increases 5-fold at the age of 40-60 years. Patients with CHD are often found at the age of 60 years and above, but currently there are also many people under the age of 60 years.⁽¹⁸⁾

Other factors can be caused by risk factors owned by the patient. Research conducted by Syafrul, et al found that there is a significant relationship between age and the incidence of Coronary Heart Disease. The appearance of symptoms of Coronary Heart Disease depends on the risk factors possessed in the individual. Some of the causative factors of coronary heart disease include dyslipidemia, smoking, age, obesity, diabetes mellitus, family history, and systemic hypertension.⁽¹⁷⁾

It was seen in the study that there were more CHD events in middle adulthood (45-60 years). Another thing that can increase the risk of coronary heart disease is high fat food intake. Excessive and prolonged fat intake can increase the occurrence of fat deposits in the blood, which can cause blockages or atherosclerosis. Consuming high saturated fatty acids will increase cholesterol levels, it is recommended to consume saturated fatty acids <10% of total calories, if cholesterol levels are still high, it is recommended to reduce to 7% of total calories.⁽¹⁹⁾ The Ministry of Health suggests that the limit of fat consumption per person per day is 67 grams or 5 tablespoons of cooking oil.⁽²⁰⁾ Research by Rahmi et al found that the incidence of CHD in ethnic Minangkabau was due to food intake that was high in animal fat, protein and cholesterol. In addition, low levels of fiber consumed also strengthen the incidence of CHD in ethnic Minangkabau.⁽²¹⁾

According to the researcher's analysis of this study, it was found that most patients experienced CHD in middle adulthood (45-60 years). The thing that causes someone in middle adulthood can already be affected by CHD because it can be influenced by several factors, namely a diet that is high in fat, lack of fiber foods, lack of activity and the presence of other risk factors that can increase the incidence of CHD such as smoking habits at a young age, family history, and gender.

B. FAMILY HISTORY

Based on the results of the study of 54 respondents, the most family history was none, namely 34 people (63.0%) and there was a family history, namely 20 people (37%) in stable coronary heart disease patients at M. Djamil Hospital Padang in 2021-2022.

The results of this study are in line with previous research conducted by Niluh in 2016 at Prof. Dr. R. D. Kandou Manado Hospital obtained the most research there is no family history, namely (80.3%), and also research by Sari, J, S. in 2017 in Makassar showed that respondents who had a history of CHD in the family were lower at 13.5% compared to respondents who did not have a family history of CHD, namely 86.5%. ^{(22), (23)} In addition, in line with research conducted by Tappi in 2022 at the Public Service Agency of the Prof. Dr. R. D. Kandou Manado Central General Hospital, the results of the study showed that most of them did not have a family history (63.5%). ⁽²²⁾

Tampubolon in 2023 at the Integrated Heart Center (PJT) of the Hajj Adam

Malik Hospital Medan obtained the results of the study that most patients with a family history were (75%).⁽²⁴⁾ The difference in the results of this study can be caused by other factors that can cause the incidence of CHD besides family history. According to the Ministry of Health, risk factors for coronary heart disease are divided into two large groups, risk factors for coronary heart disease that cannot be prevented include age, family history, gender. While preventable risk factors include hypertension, smoking, hypertension, diabetes mellitus, passive physical activity, and obesity.⁽²⁵⁾

Yulendasari (2020) says that genetic factors have a significant role in the pathogenesis of CHD, this is also used as an important consideration in the diagnosis, management and prevention of CHD. CHD tends to occur in subjects whose parents have suffered from early CHD. Parents can pass on gene mutations that can cause genetic diseases such as coronary heart disease. The percentage chance of the gene mutation decreasing is 50%. These genetic mutations can change the way certain proteins work, allowing the body to process cholesterol differently. As a result, arteries are more likely to become narrowed or blocked. If both parents suffer from CHD at a young age, their children have a high risk of developing CHD.⁽²⁶⁾

According to the researcher's analysis of this study, it was found that most patients experiencing CHD had no family history. This condition shows that the incidence of CHD is influenced by other factors besides family history factors such as a high-fat diet, lack of fiber foods, lack of activity, smoking, age, and gender.

C. Plasma Atherogenic Index

Based on the results of the study from 54 respondents, plasma atherogenic index most were moderate, namely 30 people (55.6%) in stable coronary heart disease patients at coronary disease patients at M. Djamil Hospital Padang year 2021-2022.

In line with the research of Kaniawati et al in 2021 in Bandung found that the IAP results were in the moderate category.⁽²⁷⁾ Also in line with Li et al's research in 2023 at Zhongnan hospital, found that the IAP results are in the moderate.⁽²⁸⁾

Hye Ran et al in 2022 in Korea, found that the IAP results patients were in the high category.⁽²⁹⁾ The difference in IAP results can be influenced by body cholesterol levels. Sa'adah, et al said that the higher the plasma atherogenic index, the higher the potential for the occurrence of atherosclerosis and the prevalence of cardiovascular disease. The index plasma atherogenic index will be low when total cholesterol, low LDL cholesterol, and high HDL cholesterol.⁽³⁰⁾

According to the researcher's analysis of This study found that most patients had IAP values in the moderate category. The difference between the results of results of this study with previous studies can be caused by the population criteria taken, in Hye Ran et al's study, the population used male patients with had a history of hypertension. So that, the IAP results obtained by Hye Ran et al fell into the high category, because there are risk factors for hypertension.⁽²⁹⁾

D. Degree of Stenosis

Based on the results of this study, the highest degree of stenosis was low-moderate, namely 34 people (63.0%) in stable coronary heart disease patients disease patients at M. Djamil Padang Hospital in 2021-2022.

The results of this study are in line with previous research conducted by

Cinitya in 2019 at RSI Sultan Agung Semarang obtained the results of research the most stenosis degree was low-medium (59.1%), and also in line with Shairah's research in 2023 at RSI Sultan Agung Semarang in CHD patients obtained the results research results of the most stenosis degree is low-moderate, namely (60,9%).^{(31),(32)}

Tjakradidjaja in 2020, found that 78.0% of patients had a degree of stenosis in the severe category.⁽³³⁾ Stenosis is a condition of narrowing in the blood vessels blood vessels.⁽³⁴⁾ Tjakradidjaja's research found that the factors that affecting the degree of stenosis are gender, age, and smoking status.⁽³³⁾ Research by Widyawati et al. found that there is a statistically significant relationship between total cholesterol, LDL, HDL, triglyceride with the degree of coronary artery stenosis.⁽³⁵⁾

According to the researcher's analysis of This study found that most patients had a degree of stenosis in the low-moderate category. The difference in the results of this study was influenced by several factors such as the criteria the population taken, in the study of Tjakradidjaja, the population criteria population criteria taken were male patients and had history of DM. Thus, the results of the degree of stenosis or narrowing that occurs in the blood vessels is also different due to the blood vessels are also different due to there are other risk factors. Things other things that can affect the difference the results of this study are the amount of cholesterol, the amount of fat that accumulates, calcium, and other substances that can form plaque to clog blood vessels and result in atherosclerosis. Thus, the end result that degree of stenosis will also will be different.⁽³⁶⁾

E. Relationship between Atherogenic Index Plasma Atherogenic Index with Degree of Stenosis

Based on the results of the study of 54 respondents of low-moderate stenosis degree have low-medium category IAP as well that is (61.1%). Statistical test results using the chi square test obtained p value = 0.000 ($p < 0.05$) which means there is an relationship between the Atherogenic Index Plasma (IAP) with the degree of stenosis in CHD patients at Dr M. Djamil General Hospital Padang in 2021-2022.

The results of this study are in line with research conducted by Ilhami in 2017 found that there is a correlation between plasma atherogenic index with the degree of coronary artery stenosis.⁽³⁷⁾ In line with the research of Shin et al in 2022 found that there is a correlation between plasma atherogenic index and degree of coronary artery stenosis. in 2022 found that there is a correlation of plasma atherogenic index with degree of stenosis.⁽³⁸⁾

Nansseu et al revealed that AIP does not affect the degree of stenosis. This difference may be due to the sample used, where the Nansseu study used a sample of menopausal women. The sample in this study was menopausal women. However, Nansseu stated that further research is needed regarding the significance of the data they obtained. ⁽³⁹⁾

It is proven in the study that there is a relationship between Plasma Atherogenic Index (IAP) and the degree of stenosis in CHD patients. Where it is seen that the degree of low - moderate stenosis is more common in patients with low - moderate IAP. This shows that the degree of stenosis will affect the IAP value. The condition shows that the higher the IAP value will also indicate the increasing narrowing that occurs in arterial vessels, thus causing an increase in the degree of stenosis. In accordance with the opinion of Khazaál et al that IAP has a high significance for assessing cardiovascular risk.⁽⁴⁰⁾

IAP has been shown to act as a predictive value for atherosclerosis and can be used as a high sensitivity index or a strong predictor for assessing cardiovascular risk factors, where IAP can be influenced by cholesterol levels in the body.⁽³⁵⁾ So in the assessment of IAP, there is a tendency that the higher the IAP value, the higher the degree of stenosis that occurs due to blockage in arterial vessels.⁽²⁷⁾

The results of this study also found 1 patient who had IAP in the high category, while the degree of stenosis was in the medium-high range. (1,9%). This can be caused by high triglyceride levels or hypertriglycerides in these patients. What causes high triglyceride levels can be caused by several factors, including the patient not fasting beforehand, so that the results of the examination become inaccurate because they are still influenced by food.⁽⁴¹⁾ Another factor that can cause hypertriglycerides is familial hypertriglyceridemia. This will cause familial chylomicronemia syndrome or a rare genetic disorder that causes high triglyceride levels in the blood. The lipid profile found in patients with familial chylomicronemia syndrome is usually in addition to high triglyceride levels, HDL levels are also fairly low.⁽⁴²⁾

According to the researcher's conclusion of this study, it was found that there was a relationship between IAP and the degree of stenosis, where the higher the IAP value, there would be a tendency for an increase in the degree of stenosis in CHD patients. This can prove that the IAP value has a strong sensitivity to the severity of CHD.

CONCLUSION

Based on the results of a study on the relationship between the value of the Plasma Atherogenic Index (IAP) and the degree of stenosis in patients with stable coronary heart disease (CHD) at Dr. M. Djamil Padang Hospital in 2021–2022, several important findings were obtained. The majority of respondents were in the middle age group, which was 34 people, and most did not have a family history of similar diseases, as well as 34 people. The most Plasma Atherogenic Index was in the medium category, with a total of 30 people. Meanwhile, the most common degree of stenosis found is the mild to moderate category, which is as many as 34 people. Based on data analysis, it was found that there was a relationship between the value of IAP and the degree of stenosis in CHD patients at Dr. M. Djamil Padang Hospital during this period.

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