pISSN:2355-7583 | eISSN:2549-4864
http://ejurnalmalahayati.ac.id/index.php/kesehatan

CLINICAL AND ANGIOGRAPHIC CHARACTERISTICS OF CORONARY HEART DISEASE PATIENTS AT RS JANTUNG JAKARTA

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Abstract: Clinical and Angiographic Characteristics of Coronary Heart Disease Patients at RS Jantung Jakarta. *Coronary Heart Disease (CHD) is a cardiovascular disease that impairs perfusion to the myocardium. Coronary Computed Tomography Angiography (CCTA) and Invasive Coronary Angiography (ICA) or commonly known as coronary catheterization are two possible modalities to visualize the coronary vessels in CHD patients. However, both of the modalities have their own advantages and disadvantages. This study aims to describe details of the stenosis severity frequencies in both modalities with the characteristics of these CHD patients at RS Jantung Jakarta. This study uses an observational descriptive method to assess the frequency distribution of stenosis severity in CHD patients that have completed CCTA and ICA examination at RS Jantung Jakarta with 369 patients, 1.476 coronary vessels, and 807 stenotic lesions in total. Sampling method of this study is consecutive sampling. Majority of CHD patients in this study were ≥60 years old and have obesity. Majority of the patients on this study reach the blood pressure target. Most of the patients have only one vessel with significant stenosis. Most vessel affected was LAD (Left Anterior Descending Artery). There's 71.4% of the coronary vessels detected as severe stenosis on CCTA examination but only 50.4% of the coronary vessels detected as severe stenosis on ICA examination. It can't be denied that although CT coronary angiography has high potential, it still can't replace coronary catheterization (invasive coronary angiography) as the gold standard in determining the degree of coronary artery stenosis in CHD patients due to its limitation.*

Keywords: *Coronary Computed Tomography, Coronary Catheterization, Coronary Heart Disease, Coronary Vessel, Radiology*

Abstrak: Karakteristik Klinis dan Hasil Angiografi pada Pasien PJK di RS Jantung Jakarta. Penyakit Jantung Koroner (PJK) adalah penyakit kardiovaskular yang menyebabkan gangguan perfusi ke miokardium. CT scan angiografi koroner dan angiografi koroner invasif (kateterisasi koroner) merupakan dua modalitas yang dapat dipilih sebagai pemeriksaan penunjang untuk memvisualisasikan pembuluh koroner pasien PJK. Akan tetapi, keduanya memiliki kelebihan dan kekurangannya masing-masing. Penelitian ini bertujuan untuk mendeskripsikan secara detail bagaimana sebaran derajat stenosis pada CT scan angiografi koroner dan juga kateterisasi koroner serta karakteristik pasien PJK di RS Jantung Jakarta. Studi ini menggunakan metode deskriptif observasional untuk melihat sebaran derajat stenosis pada pasien PJK yang telah mendapatkan pemeriksaan CT scan angiografi koroner dan kateterisasi koroner di RS Jantung Jakarta dengan total 369 pasien, 1.476 pembuluh koroner yang diobservasi, dengan 807 lesi stenosis sebagai subyek penelitian. Metode pengambilan sampel adalah dengan teknik consecutive sampling. Mayoritas Pasien PJK di studi ini berusia ≥60 tahun dan memiliki indeks massa tubuh obesitas. Mayoritas pasien PJK di penelitian ini memiliki profil tekanan darah sesuai target. Kebanyakan pasien hanya memiliki satu pembuluh dengan stenosis signifikan. Lokasi pembuluh koroner terbanyak dengan stenosis adalah LAD (*Left Anterior Descending Artery*). Sebanyak 71.4%

pembuluh koroner memiliki derajat stenosis berat (*severe*) pada CT scan angiografi koroner sementara hanya 50.4% pembuluh koroner dengan stenosis berat (severe) pada kateterisasi koroner. Tak dapat dipungkiri bahwa meskipun CT scan angiografi koroner memiliki potensi yang tinggi, tetap belum bisa menggantikan kateterisasi koroner sebagai baku emas dalam menentukan derajat stenosis arteri koroner pasien PJK.

Kata kunci: CT Scan Jantung, Kateterisasi Jantung, Penyakit Jantung Koroner, Pembuluh Koroner, Radiologi

INTRODUCTION

Coronary Heart Disease (CHD) is a disease that causes hypoperfusion of the heart muscle, resulting an imbalance between oxygen demand and supply in the myocardium (Shahjehan & Bhutta, 2024). Several things can be the risk factors for coronary heart disease, such as increasing age, obesity, and also high blood pressure (Brown et al., 2024). Cardiac catheterization or on another term, invasive coronary angiography, is the gold standard in diagnosing or visualizing cardiac blood vessels in CHD patients, although cardiac catheterization is minimally invasive procedure so it still carries a low but significant risk of complications (Kheiri et al., 2022). CT coronary angiography is an alternative option in diagnosing CHD patients and can assess stenosis accurately with a non-invasive procedure that the risk of complication is low ('CT or Invasive Coronary Angiography in Stable Chest Pain', 2022). Cardiac CT angiography in previous studies has proven high sensitivity and negative predictive value so that it can be used to exclude CHD for stable angina patients without a history of CHD with a moderate/intermediate possibility of developing acute coronary syndrome. However, besides the advantages of CCTA examination which is non-invasive, CCTA has several limitations such as that CCTA has lower spatial and temporal resolution compared to ICA, and also the quality of the images obtained by CCTA can be influenced by several factors so that some stenotic lesions that is actually not significant is considered significant (overestimation) by the CCTA (Abdelrahman et al., 2020).

Figure 1. Overestimation Due to the Calcified Lesion (Pack et al., 2022)

Meanwhile, determining the severity of stenosis greatly influences the management of CHD patients, so the angiographic examination is needed as accurately as possible. Because of that, this study aims to describe details of the stenosis severity frequency distribution in both modalities to see if there's any differences and also with the characteristics of these CHD patients at RS Jantung Jakarta. This study refers to the guideline from CAD-RADS 2022 as a benchmark for the stenosis degree of the coronary vessels. The degree of stenosis is assessed based on percentages, 0% represents normal (no visible stenosis), 1-24% represents minimal degree of stenosis, 25-49% represents mild degree of stenosis. 25-49% represents mild degree of stenosis, 50-69% represents moderate degree of stenosis, 70-99% represents severe stenosis, and 100% represents occlusion (Cury et al., 2022).

METHODS

This study is an observational descriptive study using secondary data in the form of medical records of CHD patients including radiology results (CT coronary angiography) and cardiac catheterization results at RS Jantung Jakarta. The samples taken were patients who had received a coronary angiography CT scan in January – June 2023, which was then followed by a coronary catheterization examination for a maximum period of 6 months to minimize the possibilities of stenosis progression. The population in this study were patients diagnosed with CHD who had received CT scan coronary angiography and coronary catheterization at RS Jantung Jakarta. The variables that taken and processed in this study were age, body mass index, blood pressure profile, location of coronary vessels with stenosis, and the stenosis degree. The inclusion criteria were coronary vessels in CHD patients who had undergone CT scan angiography and coronary catheterization with clear stenosis percentage. Exclusion criteria consisted of CT calcium score, post- percutaneous coronary intervention (PCI) patients, and post-coronary artery bypass graft (CABG) patients. Sampling was taken using consecutive sampling by collecting data from medical records (SIMRS) into Microsoft Excel and then processing them using the SPSS application. Then, the results will be presented by table or flowchart.

This study has gone through an ethical review process and was approved by the Health Research Ethics Committee of the Faculty of Medicine, Tarumanagara University with number 249/KEPK/FKUNTAR/XI/2023.

RESULTS

Per Patient Analysis

Below are the characteristics of 369 CHD patients at RS Jantung Jakarta who met the inclusion and exclusion criteria

Table 1. Frequency Distribution of CHD Patients According to Age

Age	Frequency	Percentage (%)
25-44	6	1.6
45-59	119	32.2
≥ 60	244	66.1
Total	**369**	**100**

The table above shows that the majority of patients in this study who undergone CT scan coronary angiography and coronary catheterization were aged ≥ 60 years (66.1%).

From the table 2 it can be concluded that the majority of patients have an obese BMI (66.1%) and the least is underweighted with only 1.4%.

Table 2. Frequency Distribution of CHD Patients According to Body Mass Index

Body Mass Index	Frequency	Percentage (%)
Underweight	5	1.4
Ideal	63	17.1
Overweight	57	15.4
Obese	244	66.1
Total	**369**	**100**

Table 3. Blood Pressure Profile in the ≥60 Years Age Group

Age	Blood Pressure (mmHg)				Total	
	<150/90		≥ 150/90			
	Frequency	%	Frequency	%	Frequency	%
≥60	202	82.8	42	17.2	**244**	**100**

Based on Table 3, it can be concluded that the majority of patients whose age is equal to or above 60 years reach the JNC-8 blood profile target.

From Table 4, it can be concluded that more than half of the patients in this study whose are under 60 reached the JNC-8 blood profile target.

Tabel 4. Blood Pressure Profile in the <60 Years Age Group

Age	Blood Pressure (mmHg)				Total	
	<140/90		≥ 140/90			
	Frequency	%	Frequency	%	Frequency	%
25-44	6	100	0	0	**6**	**100**
45-59	81	68.1	38	31.9	**119**	**100**
Total	**87**	**69.6%**	**38**	**30.4%**	**125**	**100**

Table 5. Frequency Distribution of the Number of Coronary Vessels with Significant Stenosis on Coronary Catheterization Examination

Number of Coronary Vessel with Significant Stenosis	Frequency	Percentage (%)
1 vessel disease	115	43
2 vessel disease	68	25.5
3 vessel disease	71	26.6
LM lesion (obstructive)	13	4.9
Total	**267**	**100**

Based on the table 5, it was found that 43% of patients in this study had only one coronary vessel with a significant stenosis lesion on coronary catheterization examination.

Based on the table 6, it can be concluded that 42.5% of vessels with stenosis are LAD and the least is LM (Left Main Artery) with only 2.5%.

Per Vessel Analysis

Tabel 6. Coronary Vessel with Stenosis

Vessel	Frequency	Percentage (%)
LAD	343	42.5
LCX	190	23.5
RCA	254	31.5
LM	20	2.5
Total	**807**	**100**

Tabel 7. Frequency Distribution of Stenosis Severity from Coronary Computed Tomography Angiography and Invasive Coronary Angiography (Coronary Catheterization)

Stenosis Degree	Coronary CT Angiography		Coronary Catheterization	
	Frequency	%	Frequency	%
Normal	1	0.1	47	5.8
Minimal	11	1.4	16	2.0
Mild	54	6.7	151	18.7
Moderate	137	17	124	15.4
Severe	576	71.4	407	50.4
Occluded	28	3.5	62	7.7
Total	**807**	**100**	**807**	**100**

From the table 7, it can be seen in detail the distribution of stenosis degree from CHD patients at RS Jantung Jakarta based on coronary computed tomography angiography and invasive coronary angiography (coronary catheterization). From these two modalities, most vessels were detected as severe stenosis (71.4% and 50.4%).

DISCUSSION

This research showed that the majority of CHD patients in this study were aged equal to or more than 60 years with a total of 244 people (66.1%). It can be concluded that the prevalence of coronary heart disease increases with age due to changes in homeostasis in old age where the coagulation cascade is disrupted and there is dysfunction of the coronary vessel endothelium (Fadah et al., 2022). This statement is supported by previous studies where the prevalence of CHD will increase after reaching the age of 35 years and above (Brown et al., 2024). There are also previous study results which stated that 96.5% of CHD patients in the study were ≥45 years old which is relevant to the results of this study (Melyani, Tambunan, and Baringbing, 2023). The reason for the higher percentage in the Melyani, Tambunan and Baringbing research is thought to be because it used a smaller sample than this research.

The majority of BMI in these 369 patients were in obesity status according to the Asia Pacific BMI classification. Obese patients have low levels of adiponectin where adiponectin has a cardioprotective function so the decrease in adiponectin will increase the incidence of atherosclerotic plaque formation (Manoharan et al., 2022). Previous research also stated that of 70 CHD patients, 56 were obese with a percentage of 80% (Valentine and Rakhmawati, 2024).

This study also describes in detail the blood pressure profile of 369 patients by referring to JNC-8 (Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure) by dividing blood pressure targets according to age. For patients whose age more than or equal to 60 use the target of <150/90 while for patients less than 60 years of age use a target of <140/90. The results obtained were that 82.8% of patients aged more than or equal to 60 years had a blood pressure profile according to the target and 69.6% of patients aged less than 60 years had a blood pressure profile according to the JNC-8 target. High blood pressure is a major risk factor for CHD and can increase the incidence of cardiovascular events. CHD patients accompanied by hypertension have worse outcomes and prognosis (Chen et al., 2022). Therefore, it is important to maintain blood pressure within the target.

Most patients in this study had only one coronary vessel with significant stenosis on coronary catheterization examination. Patients who have only one vessel with significant stenosis have a better prognosis when compared to patients with more than one significant stenosis coronary vessel or what can be called Multivessel Coronary Artery Disease (MVD)(Khaled et al., 2022).

The coronary vessel that has the most stenotic lesion is the Left Anterior Descending Artery (LAD). Depends on where the stenosis located could have the difference clinical significances. LAD is the largest coronary artery and if there is an occlusion there will be a massive damage to the myocardium (Rehman et al., 2024). However, the cause of the differences in the predilection of CAD affected vessel remains unknown (Meda et al., 2024).

Both modalities (CT coronary angiography and coronary catheterization) detected severe stenosis as the most stenotic lesion in this study. These results are relevant to the result of research in 2019 where it was found that 82.9% of patients had severe coronary stenosis (Ebasone et al., 2019). Severe stenosis on coronary computed tomography angiography was 71.4% but only 50.4% had severe stenosis when coronary catheterization was performed. There are many possible factors that can causes the difference in the stenosis degree between these two modalities, including lower spatial and temporal resolution on coronary computed tomography angiography than coronary catheterization. CT coronary angiography have been widely used to evaluate CHD patients, especially for patients in the moderate risk group for acute coronary syndrome. However, it cannot be denied that although CT coronary angiography has high potential, it still cannot replace coronary catheterization (invasive coronary angiography) as the gold standard in determining the degree of coronary artery stenosis in CHD patients due to its limitation.

Rather than replacing cardiac catheterization, coronary computed tomography angiography is considered as a screening tool (gatekeeper) before coronary catheterization is performed (Knaapen, 2019). Several things can influence the results of coronary computed tomography angiography such as weight, heart rate, and lesion with calcification that causes the overestimation (Abdelrahman et al., 2020).

CONCLUSION

From this study it can be concluded that the most stenosis in the coronary arteries of CHD patients who have undergone coronary computed tomography angiography and invasive coronary angiography (coronary catheterization) at RS Jantung Jakarta in this period of study were severe stenosis, although there is an obvious difference in the percentage. Majority of the stenotic vessel confirmed significant by coronary catheterization in this research. Majority of the patients in this study were obese and aged equal to or greater than 60 years. The majority of patients reach the blood pressure target according to JNC-8. The most coronary vessel affected were LAD (Left Anterior Descending Artery). Most of the patients only have one vessel with significant stenosis based on coronary catheterization.

It is recommended that for further research to be carried out regarding the relationship between the variables described in this study and a more in-depth analysis of the correspondence between the results of coronary CT angiography and invasive coronary angiography, especially the coronary CT angiography accuracy.

ACKNOWLEDGEMENTS

Deepest gratitude to the institutions whose support and contributions have been instrumental in the completion of this research. Thanks to Universitas Tarumanagara for facilitating this research and RS Jantung Jakarta for their collaborative efforts and providing access to the medical

record that played a crucial role in the execution of this research.

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