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Research Article

DOMINANT RISK FACTORS CORONARY ARTERY DISEASE IN CARDIAC PATIENTS IN THE CARDIAC CLINIC OF THE HOSPITAL BENGKULU PROVINCE

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ABSTRACT

Background: Coronary artery disease (CAD) is one of the leading cardiovascular diseases and the number one cause of death in the world. World Health Organization (2020) Non-communicable diseases (NCDs), which are the leading cause of death worldwide, are cardiovascular diseases. In 2017 an estimated 17.9 million people (31% of all deaths) died from cardiovascular disease.
Methods: The research design used This research design is an analytic observational using a Cross-Sectional research design that will be conducted at the RSMY Heart Poly, in June-August 2024. The number of samples in this study were 100 respondents who fit the inclusion criteria of the researchers. The analysis used in this study is to use bivariate, univariate and multivariate analysis in finding the riskiest factors.
Results: The results showed that there was an association between age, gender, occupation, family history) obesity, hypertension, diabetes mellitus, hyperlipidemia, smoking, physical activity with the incidence of coronary artery disease (CAD) in cardiac patients at the cardiac clinic of RSMY Hospital Bengkulu Province, with a P value <0.05, while the most dominant factor causing CAD was diabetes mellitus disease factor.
Conclusion: The results showed that the dominant risk factors affecting the quality of life of CAD patients in the Cardiology Clinic of RSUD Dr. M. Yunus Bengkulu Province were diabetes mellitus, followed by hypertension and smoking. This study provides important insights for the development of CAD prevention and management programs in the community.

Keywords: Coronary artery disease, cardiac, patient, hospital

INTRODUCTION

According to data from the World Health Organization (2020), Non-Communicable Diseases (NCDs) that are the main cause of death worldwide are cardiovascular diseases. In 2017, it was estimated that 17.9 million people (31% of all deaths) died from cardiovascular diseases. This disease remains the leading cause of death globally over the past 15 years.(1) Coronary artery disease (CAD) is expected to continue to rise, reaching 23.3 million deaths by 2030.(2)

Based on the basic health research data from 2018 in the Indonesian Cardiovascular Specialist Association (2019), the incidence of heart and blood vessel diseases has increased year by year, with at least 15 out of 1,000 Indonesian residents or around 2,784,964 suffering from heart disease. Coronary artery disease (CAD) is a disorder of heart function caused by the narrowing and blockage of the heart's blood vessels. This condition can lead to changes in various aspects, both physical, psychological, and social, resulting in a decrease in the functional capacity of the heart and comfort.(3)

The prevalence of death due to heart disease in Indonesia in 2021 was 38.49 million (4). CAD causes discomfort in daily life due to disturbing symptoms and the patient's perception of the disease; this can affect the Quality of Life in CAD patients.(5) The treatment of CAD aims not only to sustain the patient's life but also to improve the Quality of Life of CAD patients.(6) Quality of Life is an individual's perception and satisfaction with everything in life.(7)

Many factors influence Quality of Life, such as working, being married, being physically active, age, income, and revascularization. Quality of Life can improve due to many factors, including age, gender, occupation, marital status, surgical history, education, and religion (spiritual).(8) Research results indicate that age affects Quality of Life, consistent with Purnama's (2020) research, which states that age influences Quality of Life positively. Gender affects the Quality of Life of CAD patients positively, with males having a better Quality of Life compared to females because males are more productive than females.

CAD significantly impacts the aspects of the patient's life, including physical, psychosocial, and spiritual aspects, which influence the Quality of Life of CAD patients. Changes in physical, psychosocial, and spiritual conditions in patients with coronary heart disease affect their quality of life, and there is a significant effect on the quality of life of patients with coronary heart disease. Previous research explains that there is a very close relationship between sociodemographic and psychosocial status in coronary heart patients and their quality of life. There is an increase in Quality of Life in CAD patients who are still actively working, married, physically active, undergoing rehabilitation, and not depressed.(3,9)

Data from the Provincial Health Office shows that those who do not undergo revascularization experience worse physical aspects. However, younger CAD patients who also have more than one risk factor feel worse physically. Education level and depression are more significant predictors of the physical condition of patients. Meanwhile, for age anxiety can predict the mental health of patients with coronary heart disease. In this study, the researcher will focus on Quality of Life in CAD patients.(5)

The results of the preliminary study at RSUD dr. M. Yunus Province of Bengkulu show that the number of CAD cases is 968 or

about 5.98% of the total patients in a 1-year period from March 1, 2023, to April 25, 2024.

The results of the preliminary study conducted by the researcher at the Cardiology Clinic RSMY for CAD in the last year amounted to 968 patients. Interviews were conducted about quality of life. The results from interviews with 5 respondents of coronary heart disease patients at the Cardiology Clinic RSMY showed that 3 out of 5 respondents felt their quality of life was good, while the remaining felt it had decreased due to still experiencing anxiety and restlessness and not fully accepting their condition diagnosed with coronary heart disease.

MATERIAL AND METHODS

The design of this research is an analytical observational study using a Cross-sectional research design where the researcher measures independent variables (age, gender, occupation, family history, anxiety, depression, cardiac rehabilitation, revascularization) and dependent (Quality Of Life of Patients with Coronary Artery Disease (CAD)) simultaneously, and the results obtained describe the condition that occurs at the time of the study. The sampling technique used is purposive sampling with a total sample of 100 people aged ≥ 17 years. The analysis used in this study is univariate analysis, bivariate analysis with chi-square, and multivariate analysis with logistic regression.

RESULTS

Table 1 Distribution of Respondents Based on Age, Gender, Occupation, Family History at the Cardiology Clinic of RSMY Hospital Bengkulu Province:

Factors	Frekuensi (N=100)	Persentase (100%)
Age		
Young age	69	69,0
Old Age	31	31,0
Gender		
Female	60	60,0
Male	40	40,0
Occupation		
Working	31	31,0
Not working	69	69,0
Family history		
Family history	53	53,0
Not Family history	47	47,0
Obesity		
Obesity	24	24,0
Pre Obesity	46	46,0
Normal	16	16,0
Less	14	14,0

Table 2 Distribution of Respondents Based on Hypertension, Diabetes melitus, hyperlipidemia, smoking, Physical activity, and incident of CAD Cardiology Clinic of RSMY Hospital Bengkulu Province

Factors	Frekuensi (N=100)	Persentase (100%)
Hypertension		
Hypertension	54	54,0
Not Hypertension	46	46,0
Diabetes Melitus		
Diabetes Melitus	39	39,0
Not Diabetes Melitus	61	61,0
Hyperlipidemia		
Hyperlipidemia	71	71,0
Not Hyperlipidemia	29	29,0
Smoking		
Smoking	67	67,0
Not smoking	33	33,0
Physical activity		
Heavy	27	27,0
Medium	30	30,0
Light	43	43,0

Factors	Frekuensi (N=100)	Persentase (100%)
Incidence of CAD		
CAD	44	44,0
Not CAD	56	56,0

Table 3. Knowing the Relationship Between Independent Variables (Age, Gender, Occupation, Family History, Obesity) With Dependent Variable (Incidences Coronary Artery Disease (CAD) in Heart Patients)

Factors	Incidences Coronary Artery Disease						P-Value	OR 95%CI
	No		Yes		Total			
	N	%	N	%	N	%		
ung age	25	80,6	6	19,4	31	100		
l Age	31	44,9	38	55,1	69	100	0,002	5,108
ıder								
nale	28	70,0	12	30,0	40	100	0,036	2,667
ıle	28	46,7	32	53,3	60	100		
:upation								
orking	8	25,8	23	74,2	31	100	0,000	6,571
t working	48	69,6	21	30,4	69	100		
nily history								
nily history	21	39,6	32	60,4	53	100	0,001	4,444
Family history	35	74,5	12	25,5	47	100		
esity								
esity	5	20,8	19	79,2	24	100	0,000	-
Obesity	25	54,3	21	45,7	46	100		
rmal	12	75,0	4	25,0	16	100		
ss	14	100,0	0	0,0	14	100		

Table 4. Knowing the Relationship Between Independent Variables (Hypertension, Diabetes Melitus, Hyperlipidemia, Smoking, and Physical Activity) With Dependent Variable (Incidences Coronary Artery Disease in Heart Patients)

Domain Factor	Incidences Coronary Artery Disease in Heart Patients						P-Value	OR 95%CI
	No		Yes		Total			
	N	%	N	%	N	%		
pertension								
pertension	17	31,5	37	68,5	54	100	0,000	12,126
t Hypertension	39	84,8	7	15,2	46	100		
betes Melitus								
abetes Melitus	13	33,3	26	66,7	39	100	0,001	4,778
t Diabetes Melitus	43	70,5	18	29,5	61	100		
perlipidemia								
perlipidemia	33	46,5	38	53,5	71	100	0,005	4,414
t Hyperlipidemia	23	79,3	6	20,7	29	100		
oking								
oking	25	37,5	42	62,7	67	100	0,000	26,040
t smoking	31	93,9	2	6,1	33	100		
sical activity								
avy	8	29,6	19	70,4	27	100	0,005	-
edium	20	66,7	10	33,3	30	100		
ght	28	65,1	15	34,9	43	100		

DISCUSSION

Relationship of Age to Coronary Artery Disease Incidence

The results of this study are in line with research conducted by Purnama, et al. (2020) on "Education Can Improve the Quality of Life of Patients Diagnosed with Coronary Heart Disease" obtained results where the average age in the control group was 56.4 and the standard deviation was 7.748 with an age range between 45 years to 69 years. While in the intervention group the average age of respondents was 55.11 years, the difference in age between the control and intervention groups was 1.29, meaning that the difference in the range of differences between the control and intervention groups was not too far. Then the standard deviation of the age of respondents in the intervention group was 11.793 with an age range between 39 years to 75 years.(10-11)

The results of the study are in line with the study conducted by Cahyani, et al (2020) , where it can be concluded that the largest number of respondents were in the age group ≥ 45 years, totaling 79 respondents with a frequency of 74.5%. The results of this study are also in line with the study conducted by Rahmadanti, et al (2023) that 10 respondents (33.3%) were in the age range of 30-40 years, 8 respondents (26.7%) were aged 41-50 years, and 12 respondents (40%) were in the age range 51-60 years. Age is one of the causes of coronary heart disease because those over 45 years of age have a 32 times greater chance of suffering from Coronary Heart Disease or Coronary Artery Disease (CAD). Respondents over 40 years of age have a risk of 2.72 compared to those under 40 years of age with a p value = 0.0001, 95% CI 2.61-2.83. According to the researcher's assumption that as age increases, the

function of body organs will decrease and this can increase the risk of Coronary Artery Disease (CAD). This can be caused by unhealthy lifestyles such as lack of exercise, consumption of unhealthy foods that contain a lot of cholesterol, and an unhealthy lifestyle.(14-15)

This is in line with research conducted by Abduh, et al. (2022) on " Lipid Profile Analysis as a Predictor of Severity of Coronary Artery Disease Stenosis Assessed Using Gensini Score" where the research they have conducted involved subjects in male and female patients with an age range of 27 - 81 years, from gender data it is known that male subjects dominate with a total of 462 patients (68.6%) and female subjects as many as 211 patients (31.4%). Based on age group, the number of patients over 45 years of age (88.7%) is higher than patients under 45 years of age (11.3%).

This is in line with research conducted by Pratiwi, et al. (2019) The results of research conducted by researchers at Sultan Syarif Mohammad Alkadrie Pontianak Hospital showed the age range of respondents from the youngest 47 years old and the oldest 76 years old. The age category is mostly in the late elderly age with a range of 56-65 years totaling 22 respondents. Age is one of the factors that cannot be changed in CHD. As age increases, the occurrence of atherosclerotic disease becomes easier to occur, because the older a person is, the level of elasticity of the blood vessels will decrease which will result in easy hardening and accumulation in the blood vessels.(18-19)

Relationship of Gender to CAD Incidence

These results are in line with research by (Jannah, Mien, and Narmi 2022) The results of this study show that the majority of Coronary Artery Disease patients are men, namely 61.8%. This is in accordance with the theory that men have a 2.52 times higher tendency to experience coronary artery calcification than women. This is thought to be because high estrogen levels in women can increase the synthesis of apo AI which is the main component of highdensity lipoprotein (HDL) particles so that it will increase the synthesis of HDL particles.(21-22)

This result is also in line with research, The results of this study show that the majority of Coronary Artery Disease patients are men, namely 50.5%, men's lifestyles tend to have more risk factors for degenerative diseases such as smoking where the prevalence is 10 times that of women, high cholesterol foods and more frequent stress due to activities and social roles outside the home are higher than women.(18-19)

This result is also in line with research coronary artery disease incidents occurred in male gender 695 (55.3%). Men have a greater risk than women, and men experience it at a younger age. However, after menopause, the female mortality rate increases, but this figure is not higher than the male risk level.(11-14)

Job Relationship with CAD Insident

The results of this study are not in line with the study conducted by Naomi, et al. (2021) which stated that there is no relationship between work and coronary heart disease. Work is included in conditions that cause chronic stress that will trigger repeated myocardial infarction with increased cortisol and catecholamine hormones. Employment status is not the main determinant of a respondent having a high risk of developing CHD in 10 years if the respondent's lifestyle is good enough and

is able to manage the workload so that it does not cause stress. Other studies also state that there is no relationship between the type of work and coronary heart disease because the type of work is related to the respondent's activity level.

Research conducted also showed that there was no relationship between type of work and coronary heart disease, especially in middle adulthood (41-60 years). Type of work is related to the level of activity of respondents who have no relationship with coronary heart disease.(9,24)

Relationship of Family History to CAD Incidence

Family history is a reflection of genetic predisposition. Family history is one of the non-modifiable risk factors for atherosclerosis. These results are in line with research by Sudayasa, et al. (2020) , showing that a family history of premature CAD increases the risk of developing Coronary Artery Disease 9.4 times greater than those without a family history. Research (Supriyono et al., 2020) , states that a family history of Coronary Artery Disease in families who are directly related by blood is an independent risk factor that drives the occurrence of Coronary Artery Disease .

This result is also in line with research by (Sarini and Suharyo 2018) , showing that most patients (60.6%) have a family history of Coronary Artery Disease , it was found that patients with a family history of CAD are 3.690 times at risk of experiencing CAD in adulthood. The results of this study indicate that family history has an effect on the occurrence of CAD. The offspring of a CAD sufferer causes endothelial function in the coronary arteries so that there are changes in early atherosclerosis markers, such as brachial artery reactivity and increased carotid artery intima and thickening of the media. The presence of hypertension, such as increased hemocysteine and increased lipids, was found in these individuals.(11,15)

In line with research conducted by Shoufiah (2016) , it shows that the OR (Odds Ratio) value is 12.273, which means that respondents who have a family history of CAD have a risk of suffering from CAD 12.273 times compared to respondents who do not have a family history of CAD.

The Relationship between Obesity and CAD Incidence

This study is in line with that conducted by Iskandar et al. (2017) obtained results that subjects with a BMI> 25 m^2have a 2.7 times higher risk of developing CAD compared to subjects with a BMI <25 m^2. Obesity can also increase cholesterol levels and the risk of CAD will increase if the BMI begins to exceed 25 m^2which is caused by an unbalanced diet and consuming too much food that contains more energy than fiber. In line with research conducted by Manoharan, et al. (2022) that obesity can cause coronary heart disease, and researchers are looking for genes that contribute to the development of obesity to see if there is a link with the development of coronary heart disease. One of the molecular mechanisms responsible for obesity in early life is epigenetic gene modification through methylation, histone modification, chromatin remodeling, and changes in non-coding RNA. These epigenetic modifications increase the risk of obesity in adults and can be transmitted to future generations, thus being responsible for the obesity epidemic. Another study using G estimation for the assessment of obesity and CHD concluded that shorter survival for CHD was primarily

associated with greater levels of abdominal obesity, either predicted by waist circumference or waist-to-hip ratio.(4,30)

In G estimation, three criteria were used to quantify the impact of obesity on CHD and compared them with an accelerated failure time model. All obesity indices were associated with increased CHD risk in the first model adjusted for baseline variables while omitting metabolic mediators of obesity. Additional adjustment in the second model to account for metabolic mediators and the third model to account for time-varying factors showed minimal hazard ratios. Based on waist circumference and waist-to-hip ratio, the hazard ratios derived from G estimation for general obesity were 1.15 (95%CI: 0.83-1.47), 1.65 (95%CI: 1.35-1.92), and 1.38 (95%CI: 1.13-1.99) for abdominal obesity, respectively, suggesting that abdominal obesity increases the risk of CHD.(1,5)

In line with research conducted by Mauliza (2020) that obesity can have a negative effect on heart function during growth age where there can be an increase in heart mass and heart chamber dimensions as a result of large stroke volume and cardiac output. Obesity can affect the heart muscle through several mechanisms. The presence of obesity itself can cause chronic volume overload and increased cardiac output. Hemodynamic and metabolic factors associated with obesity can cause changes in the structure and function of the myocardium which can lead to an increase in left ventricular mass. Furthermore, hypertension associated with obesity increases heart work and stimulates heart enlargement.

The Relationship between Hypertension and CAD Incidence

These results are in accordance with research by Oktarina and Sudiarti (2022), that hypertension has a significant relationship in increasing the risk of CHD, this is in line with what was explained by Morton & Fontaine, (2012) that vasoconstrictors that increase when hypertension occurs in the vascular can accelerate the formation of foam cells and stimulate cell growth in the endothelium so that it can form atherosclerosis. These results are also in line with research by Yolino, Arianto, and Saptiningsih (2022), with almost half (39.9%) of patients experiencing hypertension. Hypertension is accompanied by increased oxidative stress and activity of radical oxygen species which will mediate blood vessel damage due to angiotensin II activation, thereby aggravating endothelial dysfunction and increasing the risk of CAD.

These results are in line with research by Sunarti and Maryani (2019), which showed that 109 patients treated at Sukoharjo District Hospital, patients with hypertension had a 1,533 times greater risk of suffering from coronary heart disease compared to patients with normotension. And there is a significant relationship between blood pressure and the incidence of CAD in patients at Sukoharjo District Hospital value = 0.022).

If systemic blood pressure increases, blood will be pumped from the left ventricle, so that the workload of the heart increases and can cause ventricular hypertrophy as compensation for the contraction force which will eventually cause dilation and heart failure. Atherosclerosis occurs preceded by chronic endothelial injury due to the tensile force that arises from the blood pressure itself, increasing atherosclerosis which will

cause ventricular hypertrophy and increased heart workload, leading to myocardial infarction. Patients generally suffer from hypertension within a period of >10 years before finally being affected by CAD.(4,30)

Relationship between Diabetes Mellitus and CAD Incidence

This study is in line with research conducted by Al-Nozha, et al (2019) that Coronary artery disease (CAD) is the leading cause of death in Western countries, and is the leading cause of death in developing countries. This increase may be due to the increasing prevalence of various CHD risk factors, such as diabetes, which is one of the most important risk factors. Diabetic patients show an increased risk of atherosclerotic coronary heart disease for various reasons, including metabolic factors, such as hyperglycemia, dyslipidemia, and insulin resistance, which cause endothelial cell dysfunction, vascular smooth muscle, and others, platelet dysfunction and abnormal coagulation. Diabetic patients tend to show other risk factors for coronary heart disease, such as hypertension and obesity. Diabetic patients have lipid-rich atherosclerotic plaques, which are more prone to rupture than plaques seen in non-diabetic patients. Researchers describe an overall increase in atherosclerotic burden and a 3.5-fold higher risk of coronary stenosis independent of other cardiovascular risk factors in diabetic patients.(1,9)

This is in line with Pakaya's research (2022) which states that Diabetes mellitus is one of the modifiable risk factors for coronary heart disease (CHD), people with diabetes suffer from more severe, more complex CHD than age-matched control groups. Patients with diabetes mellitus are at greater risk (200%) for CHD than individuals without diabetes. Although diabetes is an independent risk factor for CHD, it is also associated with lipid metabolism abnormalities, obesity, systemic hypertension, and increased thrombogenesis. People with diabetes have increased premature mortality and the risk of recurrent stenosis after coronary angioplasty.

Rahmawati et al.'s research (2020) stated in their research that there is an association between the incidence of CHD and Diabetes Mellitus.(7) In the analysis of the relationship between the incidence of CHD and Diabetes Mellitus, by comparing it to non-diabetic patients, the results of the study stated that, Diabetes has a 16,996 times risk of experiencing CHD compared to those who do not suffer from Diabetes. This is supported by the American Heart Association (AHA) annual report that the factors that cause the highest incidence of Coronary Heart Disease are fat deposits, or unhealthy diets and Diabetes Mellitus.

Diabetes mellitus is a dominant factor affecting the Quality of Life of patients with Coronary Artery Disease.

Based on the research that has been done, the multivariate test results above show that the age variable with a p value = 0.187 and an Exp (B) value = 3.289, the gender variable with a p value = 0.261 and an Exp (B) value = 0.332, the employment variable with a p value = 0.959 and an Exp (B) value = 0.953, the family history variable with a p value = 0.101 and an Exp (B) value = 6. 039, Variable Obesity with p value = 0.009 and Exp (B) value = 3,704, Variable Hypertension with p value = 0.031 and Exp (B) value = 3,704, Variable Diabetes mellitus with p value = 0.005 and Exp (B) = 51. 947, Variable Hyperlipidemia with p value = 0.012 and Exp (B) value = 15,864,

Variable Smoking with p value = 0.021 and Exp (B) value = 13,668, Variable Physical activity with p value = 0.035 and Exp (B) value = 3,326.

From the data above, it can be concluded that the variable with the largest Exp(B) value is the diabetes mellitus variable, which is 51.947, meaning that the diabetes mellitus variable is the most dominant risk factor influencing the occurrence of coronary artery disease (CAD) in heart patients at the Heart Polyclinic of RSUD dr. M. Yunus, Bengkulu Province. Diabetes mellitus is the main risk factor for the development of CAD. The prevalence of coronary heart disease in diabetes mellitus is 9.2%, and after being controlled for other factors, the risk is 8.43 times compared to those without diabetes mellitus.(24-30)

Diabetes mellitus increases the risk of heart disease, including coronary heart disease, by 4.06 times compared to those without diabetes mellitus (Yuliani et al., 2014). Diabetes patients tend to experience tissue degeneration and endothelial dysfunction more quickly, leading to the thickening of the basal membrane of capillaries and coronary artery blood vessels, resulting in narrowing of blood flow to the heart.(35) With the presence of glucose resistance, glucose in the blood will increase, which will increase blood viscosity. The tendency for atherosclerosis to occur also increases and can result in coronary heart disease. Diabetes causes blood fat levels to rise due to impaired body fat conversion. For diabetes patients, increased blood fat levels significantly increase the risk of heart disease and stroke.(26,31-35) Diabetes accelerates the occurrence of atherosclerosis in both small and large blood vessels throughout the body, including the blood vessels of the brain and heart.(36)

CONCLUTION

The results showed that the dominant risk factors affecting the quality of life of CAD patients in the Cardiology Clinic of RSUD Dr. M. Yunus Bengkulu Province were diabetes mellitus, followed by hypertension and smoking. This study provides important insights for the development of CAD prevention and management programs in the community.

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