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Analysis of Characteristics and Risk Factors for the Incidence of Coronary Heart Disease in Hospitals General Royal Prima for the Period January-December 2024

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ABSTRACT

Coronary heart disease (CHD) remains the leading cause of death both globally and nationally, and it is closely associated with various cardiometabolic and behavioral risk factors. This study aims to analyze the characteristics and risk factors related to the incidence of CHD at Royal Prima Hospital during the January-December 2024 period. The research employed an observational analytical design with a medical record–based case-control approach, involving 120 respondents (60 CHD cases and 60 non-CHD cases) selected through consecutive sampling. Independent variables included age, gender, hypertension, dyslipidemia, diabetes mellitus, obesity, and smoking history. Data analysis was conducted using univariate, bivariate (Chi-Square test), and multivariate (binary logistic regression) methods. The results showed that all risk factors were significantly associated with the incidence of CHD in bivariate analysis ($p < 0.05$). Multivariate analysis indicated that age ≥45 years, dyslipidemia, hypertension, diabetes mellitus, smoking history, and male sex had a significant effect on CHD, with age ≥45 years as the most dominant factor, while obesity showed no independent effect. These findings emphasize the importance of controlling the main risk factors in the prevention of CHD in health care facilities.

Keywords: *coronary heart disease; risk factors; logistic regression*

INTRODUCTION

Coronary heart disease (CHD) is one of the non-communicable diseases (NCDs) that remains the leading cause of death worldwide, causing a significant health and economic burden across countries (Roh, 2023). Based on the latest report by the World Health Organization in 2024, titled *The Top 10 Causes of Death*, in 2021 there were ten main causes of death globally, accounting for around 39 million deaths, or about 57% of the total 68 million deaths worldwide. Among these, ischemic heart disease ranks first, contributing about 16% of all deaths globally, followed by COVID-19 and stroke. This condition demonstrates that non-communicable diseases such as coronary heart disease still dominate the causes of global mortality and present a major challenge for health systems in various countries (World Health Organization, 2024).

The Global Health Estimates (GHE) 2000–2021 report published by WHO further confirms that ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD), and diabetes mellitus are the four leading causes of death worldwide, particularly in lower-middle-income countries. The increase in mortality due to CHD is largely influenced by lifestyle changes, urbanization, and the rising prevalence of metabolic risk factors including hypertension, dyslipidemia, obesity, and diabetes. These epidemiological shifts have caused a change in disease patterns from infectious to non-communicable diseases, which are now the primary causes of death globally (World Health Organization, 2024).

Similar trends occur in Indonesia, where coronary heart disease remains one of the leading causes of death and continues to show an increasing trend annually. According to data from the WHO Global Health Estimates (2021), more than 52% of deaths in Indonesia are caused by non-communicable diseases, with ischemic heart disease and stroke ranked at the

top. A report from the Ministry of Health of the Republic of Indonesia (2023) states that the prevalence of heart disease in Indonesia reaches 0.85% of the total population, and ischemic heart disease accounts for approximately 13.8% of all national deaths. The results of Basic Health Research in 2018 also showed that the prevalence of heart disease increases with age, especially in those over 45 years, and is more common in men than women before menopause due to the protective effect of estrogen (Riskesdas, 2018). Aside from age and gender, behavioral risk factors such as smoking, physical inactivity, consumption of high-fat foods, and poor glucose control further exacerbate the situation. Coronary heart disease not only causes death but also leads to decreased productivity, impaired quality of life, and increased health financing burdens (Ministry of Health of the Republic of Indonesia, 2023).

At the regional level, North Sumatra Province faces a similar challenge with a rising burden of heart disease. Based on the 2023 North Sumatra Provincial Health Profile published by the North Sumatra Provincial Health Office, non-communicable diseases, including cardiovascular diseases, are among the highest causes of death in the region (North Sumatra Provincial Health Office, 2023). Data from the Central Statistics Agency (BPS) of North Sumatra in 2022 also show an increase in cases of circulatory system diseases reported across various districts/cities during 2020–2022 (Central Statistics Agency of North Sumatra Province, 2022). This illustrates the continuing rise of cardiovascular disease burden in the province, posing a significant challenge for health services. Meanwhile, a report from the Medan Ministry of Health Polytechnic Repository (2024) indicates that CHD cases in North Sumatra are projected to reach approximately 4,454 cases in 2023, while H. Adam Malik Hospital Medan recorded 2,501 coronary heart disease patients treated in the January-December 2024 period (Medan Ministry of Health Polytechnic, 2024). Although these figures are administrative and do not fully represent population prevalence, they underline that coronary heart disease is a significant health burden in North Sumatra. Research from the University of North Sumatra also found that risk factors such as smoking, hypertension, diabetes mellitus, dyslipidemia, and obesity significantly influence the incidence of coronary heart disease in patients at a referral hospital in Medan, mirroring national and global patterns (University of North Sumatra, 2024).

Pathophysiologically, coronary heart disease results from atherosclerosis—the accumulation of lipids, cholesterol, and inflammatory substances on the coronary artery walls causing narrowing and reduced blood flow to the myocardium. The atherosclerosis process begins with endothelial dysfunction, damage to the blood vessel's inner lining caused by exposure to high blood pressure, hyperglycemia, and toxins from cigarette smoke. This dysfunction increases vessel wall permeability to low-density lipoprotein (LDL) particles, which oxidize and trigger chronic inflammation. Macrophages engulf oxidized LDL, forming foam cells that develop into atheromatous plaques. Over time, arterial walls thicken, elasticity declines, and plaques risk rupturing to form thrombi, causing myocardial ischemia (World Health Organization, 2024; Zhao, Huang, & Chen, 2023; European Society of Cardiology, 2023; American Heart Association, 2022).

The risk factors examined in this study play crucial roles in accelerating atherosclerosis. Age ≥45 years increases risk due to reduced vascular elasticity and endothelial function; males have higher risk because of lower estrogen levels, which are protective; hypertension elevates arterial wall pressure; dyslipidemia accelerates LDL accumulation; diabetes promotes oxidative stress and vascular inflammation; obesity—especially central obesity—stimulates pro-

inflammatory cytokines; and smoking causes vasoconstriction and increased platelet aggregation, impairing cardiac perfusion (ESC, 2023; JD, 2022; WHO, 2024). These factors act synergistically, amplifying CHD risk, making risk factor management essential for prevention (Zhao et al., 2023).

Several Indonesian studies support this evidence. Research by Wulandari and Nugroho (2024) at Dr. Kariadi Hospital Semarang found that high LDL and low HDL significantly increase CHD risk. Hafiza, Candra, and Lidiawati (2024) in Banda Aceh reported that hypertensive patients have nearly tenfold increased CHD risk compared to normotensive individuals. Rudi and Sitorus (2023) also showed smoking raises CHD risk five times over non-smokers, especially when combined with dyslipidemia and diabetes mellitus. These findings highlight the importance of managing cardiometabolic risk factors for CHD prevention (Wulandari & Nugroho, 2024; Hafiza et al., 2024; Rudi & Sitorus, 2023).

Despite multiple studies on CHD risk factors in Indonesia, many are local with limited population coverage and bivariate analyses, unable to provide a comprehensive picture of each risk factor's relative contribution. Moreover, some focus solely on single factors like hypertension or dyslipidemia, without considering simultaneous interactions among metabolic and behavioral risks. This limits understanding of risk variation among patients with diverse backgrounds.

Further gaps arise from limitations of longitudinal and hospital-based data, essential for tracking changing risk patterns over time. Most Indonesian research uses general population surveys such as Riskesdas, useful nationally but insufficient to reflect specific clinical conditions in healthcare facilities (Ministry of Health of the Republic of Indonesia, 2023). Hospital data can offer clearer insight into patient clinical profiles, disease severity, and risk factor interactions. Thus, studies combining multivariate analysis with current clinical data are needed to identify dominant factors influencing CHD incidence locally and regionally.

In North Sumatra Province, facility-based data availability—especially at Royal Prima General Hospital Medan—remains limited, providing only administrative descriptive reports without multivariate analyses to determine principal CHD risk factors. Hence, this study is urgently needed as a local scientific update using the latest 2024 clinical data. It focuses on seven main risk factors: age, sex, hypertension, dyslipidemia, diabetes mellitus, obesity, and smoking history—all scientifically proven as key in CHD pathogenesis.

Besides contributing scientifically, the study's results are expected to offer practical benefits for health policy planning, strengthening prevention and control strategies for coronary heart disease at the hospital level. The findings can underpin promotive and preventive policies such as enhanced early detection of cardiovascular risks, patient education, and optimized urban clinical services in North Sumatra. This approach aims to fill research gaps and enrich local evidence supporting the national NCD control program.

This study was conducted to *analyze the characteristics and influence of various risk factors*—age, sex, hypertension, dyslipidemia, diabetes mellitus, obesity, smoking history—on coronary heart disease (CHD) incidence at Royal Prima General Hospital during the January-December 2024 period. Its goal is to provide a comprehensive scientific depiction of relationships and dominant factors affecting CHD in North Sumatra and to support cardiovascular disease prevention policy strengthening. The research problem includes identifying patient characteristics by risk factors, analyzing relationships between risks and

CHD incidence, and determining the most influential factors. The general study objective is to analyze patient characteristics, risk relationships, and CHD risk factors, with specific aims to identify characteristics, analyze risk variable relations, and pinpoint dominant factors. This research benefits the author by enhancing analytical and methodological skills, aids health workers in developing promotive, preventive, and curative strategies, helps the community increase CHD risk awareness, and provides future researchers a reference for more detailed investigations.

METHOD

This study employed an observational analytical design with a case-control approach, where the case group consisted of patients with coronary heart disease (CHD) and the control group included patients without CHD from the same hospital population. The research was conducted at Royal Prima Hospital Medan from February to September 2025, using secondary data from patients' medical records for the January-December 2024 period. The study population included all hospital patients, and samples were obtained through consecutive sampling by matching age and sex to reduce bias. The total sample comprised 120 respondents, with 60 cases and 60 controls, meeting the minimum requirement for logistic regression analysis. Inclusion criteria were patients aged ≥30 years with a CHD diagnosis and complete medical records; exclusions included incomplete records, non-CHD diagnoses, and severe systemic diseases.

Data were collected retrospectively by reviewing medical records using structured observation sheets, followed by verification for data completeness. Data analysis was performed using SPSS in three stages: univariate analysis to describe respondent characteristics, bivariate analysis with the Chi-Square test to explore relationships between risk factors and CHD incidence, and multivariate analysis using binary logistic regression with the Backward LR method to identify dominant risk factors. Multivariate results were reported as Adjusted Odds Ratios (AOR) with 95% confidence intervals and p-values to assess significance. This approach aimed to produce valid findings and identify the main risk factors for CHD in patients at Royal Prima Hospital to support clinical policy and prevention program development.

RESULTS AND DISCUSSION

The results of the research that will be presented are in the form of the results of the analysis of medical record data of patients at Royal Prima General Hospital. The data was processed and analyzed univariately, bivariately and multivariately, then the results were presented in the form of a table.

Univariate Analysis Results

The univariate analysis in this study included variables of age, sex, hypertension, dyslipidemia, diabetes mellitus, obesity, and the patient's smoking history. This analysis aims to determine the frequency and percentage distribution of each variable so that an overview of the characteristics of coronary heart disease patients at Royal Prima Hospital is obtained.

Patient Characteristics by Age Group

The distribution of coronary heart disease (CHD) and non-CHD patients by age group is presented in table 1 below:

Table 1 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients by Age Group at Royal Prima Hospital

Age	PJK		Non-PJK		Total	
	n	%	n	%	n	%
≥45	52	86,7	24	40,0	76	63,3
<45	8	13,3	36	60,0	44	36,7
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on table 1, it is known that out of a total of 120 research subjects (patients) at Royal Prima Hospital, most of the patients were in the age group of ≥45 years, which was 76 people (63.3%), while patients with the age of <45 years were 44 people (36.7%). In the group of patients with coronary heart disease (CHD), it is known that the majority of patients aged ≥45 years are 52 patients (86.7), while those aged <45 years are only 8 patients (13.3%). Meanwhile, in the non-CHD group, 24 patients aged ≥45 years (40%) and those aged <45 years were 36 patients (60%).

Characteristics of patients by gender

The distribution of coronary heart disease (CHD) and non-CHD patients by gender is presented in the following table 2:

Table 2 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients by Gender at Royal Prima Hospital

Gender	PJK		Non-PJK		Total	
	N	%	n	%	n	%
Man	49	81,7	25	41,7	76	61,7
Woman	11	18,3	35	58,3	44	38,3
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 2, it is known that out of a total of 120 study subjects, as many as 76 patients (61.7%) were male and 44 patients (38.3%) were female. This shows that most of the patients in this study were male. In the group of patients with coronary heart disease (CHD), the number of men was much higher than that of women, namely 49 patients (81.7%) and 11 patients (18.3%) respectively. On the other hand, in the non-CHD group, the number of women was higher than men, namely 35 patients (58.3%) and 25 patients (41.7%) respectively.

Patient Characteristics Based on Hypertension Status

The distribution of coronary heart disease (CHD) and non-CHD patients based on hypertension status is presented in table 3 below:

Table 3 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients Based on Hypertension Status at Royal Prima Hospital

Hypertension Status	PJK		Non-PJK		Total	
	n	%	n	%	n	%
Yes	37	61,7	4	6,7	41	34,2
No	23	38,3	56	93,3	79	65,8
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 3, it is known that out of a total of 120 study subjects, as many as 41 patients (32%) had hypertension and 79 patients (65.8%) did not have hypertension. In the group of patients with coronary heart disease (CHD), there were 37 patients (61.7%) with hypertension and 23 patients (38.3%) without hypertension. Meanwhile, of the group of patients who did not suffer from coronary heart disease, there were 4 patients (6.7%) who had hypertension and 56 patients (93.3%) who did not have hypertension.

Patient characteristics based on dyslipidemia status

The distribution of coronary heart disease (CHD) and non-CHD patients based on dyslipidemia status is presented in the following table 4:

Table 4. Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients by Dyslipidemia Status at Royal Prima Hospital

Dyslipidemia status	PJK		Non-PJK		Total	
	n	%	n	%	n	%
Yes	31	51,7	7	11,7	38	31,7
No	29	48,3	53	88,3	82	68,3
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 4, it is known that out of a total of 120 study subjects, as many as 38 patients (31.7%) had dyslipidemia and 82 patients (68.3%) did not experience dyslipidemia. In the group of patients with coronary heart disease (CHD), there were 31 patients (51.7%) with dyslipidemia and 29 patients (48.3%) without dyslipidemia. Meanwhile, from the group of patients who did not suffer from coronary heart disease, there were 7 patients (11.7%) who had dyslipidemia and 53 patients (88.3%) who did not have dyslipidemia.

Patient Characteristics Based on Diabetes Mellitus Status

The distribution of coronary heart disease (CHD) and non-CHD patients based on diabetes mellitus status is presented in the following table 5:

Table 5 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients Based on Diabetes Mellitus Status at Royal Prima Hospital

Diabetes Status	PJK		Non-PJK		Total	
	n	%	n	%	n	%
Yes	29	48,3	3	5,0	32	26,7
No	31	51,7	57	95,0	88	73,3
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 5, it is known that out of a total of 120 study subjects, as many as 32 patients (26.7%) had diabetes mellitus and 88 patients (73.3%) did not have diabetes mellitus. In the group of patients with coronary heart disease (CHD), there were 29 patients (48.3%) with diabetes mellitus and 31 patients (51.7%) with no diabetes mellitus. Meanwhile, from the group of patients who did not suffer from coronary heart disease, there were 3 patients (5.0%) who had diabetes mellitus and 57 patients (95.5%) who did not have diabetes mellitus.

Patient Characteristics Based on Obesity Status

The distribution of coronary heart disease (CHD) and non-CHD patients based on obesity status is presented in the following table 6

Table 6 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients by Obesity Status at Royal Prima Hospital

Status Obesity	PJK		Non-PJK		Total	
	n	%	n	%	n	%
Yes	36	60,0	19	31,7	55	45,8
No	24	40,0	41	68,3	65	54,2
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 6, it is known that out of a total of 120 study subjects, as many as 55 patients (45.8%) were obese and 65 patients (52%) were not obese. In the group of patients with coronary heart disease (CHD), there were 36 patients (60.0%) who were obese and 24 patients (40.0%) who were not obese. Meanwhile, of the group of patients who did not suffer from coronary heart disease, there were 19 patients (31.7%) who were obese and 41 patients (68.3%) who were not obese.

Patient Characteristics Based on Smoking History Status

The distribution of coronary heart disease (CHD) and non-CHD patients based on smoking status is presented in table 7 below:

Table 7 Distribution of Coronary Heart Disease (CHD) and Non-CHD Patients Based on Smoking Status at Royal Prima Hospital

Smoking Status	PJK		Non-PJK		Total	
	n	%	n	%	n	%
Yes	38	63,3	18	30,0	56	46,7
No	22	36,7	42	70,0	64	53,3
Total	60	100	60	100	120	100

Source: Medical Record Data (2024)

Based on Table 7, it is known that out of a total of 120 study subjects, as many as 56 patients (46.7%) had a history of smoking and 64 patients (53.3%) did not smoke. In the group of patients with coronary heart disease (CHD), there were 38 patients (63.3%) with a history of smoking and 22 patients (36.7%) who did not smoke. Meanwhile, of the group of patients who did not suffer from coronary heart disease, there were 18 patients (30.0%) who had a history of smoking and 42 patients (70.0%) did not smoke.

Bivariate Analysis Results

Bivariate analysis was carried out to determine the relationship between independent variables (risk factors) and dependent variables, namely the incidence of coronary heart disease (CHD) in patients at Royal Prima Hospital.

Chi-Square Test Results

Bivariate analysis using the Chi-Square test was carried out to determine the relationship between each independent variable (age, sex, hypertension, dyslipidemia, diabetes mellitus, obesity, and smoking history) with the dependent variable, namely the incidence of coronary heart disease (CHD). This analysis was carried out with a significance level (α) = 0.05. If the p< value is 0.05, then the relationship between the variables is statistically significant. The results of the Chi-Square test analysis are presented in Table 8 below.

Table 8 Relationship between Risk Factors (Age, Sex, Hypertension Status, Dyslipidemia, Diabetes Mellitus, Obesity and Smoking History) with the Incidence of Coronary Heart Disease at Royal Prima Hospital

Variable	PJK		Non-PJK		Total		p Value
	n	%	n	%	n	%	
Age							
≥45	52	86,7	24	40,0	76	63,3	0,001
<45	8	13,3	36	60,0	44	36,7	
Total	60	100	60	100	120	100	
Gender							
Man	49	81,7	25	41,7	76	61,7	0,001
Woman	11	18,3	35	58,3	44	38,3	
Total	60	100	60	100	120	100	
Hypertension							
Ya	37	61,7	4	6,7	41	34,2	0,001
No	23	38,3	56	93,3	79	65,8	
Total	60	100	60	100	120	100	
Dyslipidemia							
Ya	31	51,7	7	11,7	38	31,7	0,001
No	29	48,3	53	88,3	82	68,3	
Total	60	100	60	100	120	100	
Diabetes							
Ya	29	48,3	3	5,0	32	26,7	0,001
No	31	51,7	57	95,0	88	73,3	
Total	60	100	60	100	120	100	
Obesity							
Ya	36	60,0	19	31,7	55	45,8	0,002
No	24	40,0	41	68,3	65	54,2	
Total	60	100	60	100	120	100	
Smoke							
Ya	38	63,3	18	30,0	56	46,7	0,001
No	22	36,7	42	70,0	64	53,3	
Total	60	100	60	100	120	100	

Source: Medical Record Data (2024)

Based on the results of the Chi-Square test in Table 8, it is known that all study variables have a p-value of < 0.05, which shows a statistically significant relationship with the incidence of coronary heart disease (CHD) at Royal Prima Hospital. The results of the analysis showed that the age variable had a value of p = 0.001, sex p = 0.001, hypertension p = 0.001, dyslipidemia p = 0.001, diabetes mellitus p = 0.001, obesity p = 0.002, and smoking history p = 0.001. Thus, it can be concluded that all of these factors including age, male sex, history of hypertension, dyslipidemia, diabetes mellitus, obesity, and smoking are significantly related to the incidence of coronary heart disease in patients at Royal Prima Hospital.

Multivariate Analysis

Multivariate analysis was conducted to determine the risk factors that had the most influence on the incidence of coronary heart disease (CHD) after being controlled by other variables that were also related to bivariate analysis.

Binary Logistics Regression Test Results

The method used at this stage is a binary logistics regression test, because the dependent variables are dichotomous (CHD and non-CHD patients). The independent variables included in the multivariate model are those that have a p-value of < 0.25 in bivariate analysis. This analysis produced the Odds Ratio (Exp B), Confidence Interval (CI 95%), and p-value for each variable, so that it can be known that the dominant risk factors have the most influence on the incidence of CHD in patients at Royal Prima Hospital. The results of the multivariate analysis are presented in the following Table 9:

Table 9 Multivariate Analysis Candidate Variables (p < 0.25)

Variable	p-value
Age	0,001
Gender	0,001
Hypertension	0,001
Dyslipidemia	0,001
Diabetes Melitus	0,001
Obesity	0,002
Smoke	0,001

Source: Medical Record Data (2024)

Based on Table 9 of Multivariate Analysis Candidate Variables ($p < 0.25$), it is known that there are seven variables that meet the criteria to be included in the multivariate analysis using a binary logistics regression test. These variables were age, gender, hypertension, dyslipidemia, diabetes mellitus, obesity, and smoking history.

All of these variables had a p-value of < 0.25 in bivariate analysis, which means that there was a fairly strong relationship between each independent variable and the incidence of coronary heart disease (CHD). A p-value below 0.25 indicates that these variables have statistically significant potential and are feasible to proceed to the multivariate analysis stage to determine the variables that have the most influence on the incidence of CHD after being controlled with other variables.

After selecting variables with a p-value of < 0.25 in bivariate analysis, the next stage is to conduct a model feasibility test (Goodness of Fit Test) to assess whether the logistics regression model to be used is feasible (fit) with the research data. The feasibility test of this model is carried out using the Hosmer and Lemeshow Test, which aims to find out the extent to which the model's prediction results are in accordance with the observation data, further presented in the following table:

Tabel 10. Goodness of Fit Test/Hoshmer and Lemeshow Test

Step	Chi-Square	df	Sig.
2	6.950	8	0.542

Source: Medical Record Data (2024)

The results of the Hosmer and Lemeshow Goodness of Fit Test showed a p-value of 0.542, which is greater than 0.05. This means that the logistic regression model is worth using (fit). Thus, the model formed is in accordance with the research data and can be trusted to explain the influence of independent variables on the incidence of coronary heart disease in patients at Royal Prima Hospital.

After the model was declared feasible, a binary logistics regression test was carried out to find out which variables had a significant effect on the incidence of coronary heart disease (CHD). Furthermore, the results of the binary logistics regression test are presented in the following table:

Table 11. Binary Logistic Regression Test Results

							95% Cl for Exp(B)	
Variable	**B**	**S.E**	**Forest**	**df**	**Sig.(p)**	**Exp(B)**	**Lower**	**Upper**
Age(1)	2.576	.802	10.321	1	.001	13.146	2.731	63.290
Gender(1)	1.421	.708	4.031	1	.045	143	1.034	16.592
Hypertension(1)	2.266	.775	8.552	1	.003	9.642	2.111	44.033
Dyslipidemia(1)	2.560	.828	9.553	1	.002	12.931	2.551	65.552
Diabetes M(1)	1.920	.811	5.607	1	.018	6.818	1.392	33.397
Smoking(1)	1.506	.708	530	1	.033	509	1.126	18.048
Obesity(1)	-.296	.914	.105	1	.746	.744	.124	460

Source: Medical Record Data (2024)

Based on the results of binary logistics regression analysis, it was found that several variables have a significant influence on the incidence of coronary heart disease (CHD). These variables included age, gender, hypertension, dyslipidemia, diabetes mellitus, and smoking history. The results of the analysis showed that the age variable had a value of p = 0.001 with Exp(B) = 13.146, which means that patients aged ≥45 years have a 13 times greater chance of developing coronary heart disease than patients aged <45 years. Gender had a value of p = 0.045 with Exp(B) = 143, which suggests that men have about 4 times higher risk of developing coronary heart disease than women. The hypertension variable showed a value of p = 0.003 and Exp(B) = 9.642, meaning that patients with a history of hypertension were 9 times more likely to suffer from coronary heart disease than patients without hypertension. Furthermore, the dyslipidemia variable had a value of p = 0.002 and Exp(B) = 12.931, indicating that patients with dyslipidemia had about 13 times greater chance of developing coronary heart disease than patients without dyslipidemia. The diabetes mellitus variable had a p= value of 0.018 with Exp(B) = 6.818, which means that patients with diabetes mellitus have a risk of about 7 times greater risk of developing coronary heart disease than non-diabetic mellitus patients. The smoking history variable had a value of p = 0.033 with Exp(B) = 509, indicating that patients with a history of smoking had a approximately 5 times higher risk of developing coronary heart disease than non-smoking patients. The obesity variable had a value of p = 0.746 (>0.05), so it did not have a significant effect on the incidence of coronary heart disease.

Based on the results of binary logistic regression analysis, it was found that the variables that had a significant effect on the incidence of coronary heart disease were age, gender, hypertension, dyslipidemia, diabetes mellitus, and smoking history. Meanwhile, obesity had no significant effect (p = 0.746) and was excluded from the model.

Of all the significant variables, age was the most dominant factor with the highest Exp(B) value of 13.146. This suggests that patients with the age of ≥45 years have about 13 times greater chance of developing coronary heart disease than patients aged <45 years after controlling for other variables.

This chapter discusses the results of the research that has been presented in the previous chapter. The discussion was carried out to explain the meaning of the research results and relate them to relevant theories and previous research results. The discussion in this study includes three main parts, namely respondent characteristics, the relationship between independent variables and the incidence of coronary heart disease (CHD), and the influence of risk factors on the incidence of coronary heart disease.

Patient Characteristics

Patient Characteristics by Age Group

Based on Table 1, of the 120 patients studied at Royal Prima Hospital, the majority were in the age group of ≥45 years (63.3%). This proportion is much more prominent in the case group (CHD), which is 86.7%, compared to the control group (non-CHD) of 40.0%. These findings suggest that age is a factor strongly related to the incidence of coronary heart disease.

The results of this study are consistent with a study conducted by Hafiza, Candra, and Lidiawati (2024) at Umi Rosnati Banda Aceh Hospital which reported that the majority of CHD patients were ≥45 years old. The study explained that the risk of CHD increases with age due to the accumulation of metabolic risk factors such as hypertension, dyslipidemia, and diabetes mellitus. A similar study was also conducted by Ariani and Dewi (2023) at dr. Moewardi Surakarta Hospital, which showed that 78% of CHD patients were included in the elderly group.

The results of national research also support these findings. Based on a report by the Indonesian Ministry of Health (2023), the prevalence of coronary heart disease has increased sharply in the age group over 45 years old. The increase was associated with lifestyle changes, a high-fat diet, lack of physical activity, and the accumulation of cardiovascular risk factors as we aged.

Thus, it can be concluded that the age group of ≥45 years is the group with the highest proportion of coronary heart disease patients at Royal Prima Hospital. This is in line with previous theories and studies that show that age is an important factor that plays a role in increasing the risk of coronary heart disease.

Characteristics of patients by gender

Based on Table 2, out of a total of 120 patients studied at Royal Prima Hospital, 76 patients (61.7%) were male and 44 patients (38.3%) were female. In the group with coronary heart disease (CHD), the proportion of men is much higher, at 81.7%, while women are only 18.3%. On the other hand, in the non-CHD group, the proportion of women (58.3%) was higher than that of men (41.7%).

The findings of this study are also in line with the results of research by Prakoso et al. (2023) which show that in Indonesia, the prevalence of coronary heart disease is higher in men than women, especially in the age group over 40 years old. The same results were reported by Rahmadani and Putra (2023) at Dr. Zainoel Abidin Hospital in Banda Aceh, where male patients dominated the CHD patient group with a proportion of more than 70%. This difference is associated with riskier lifestyles in men, such as smoking habits, work stress, and lack of physical activity.

Thus, it can be concluded that the majority of coronary heart disease patients at Royal Prima Hospital are men, and this pattern is consistent with the results of studies in various regions in Indonesia.

Characteristics of patients based on hypertension status

Based on Table 3, out of a total of 120 patients studied at Royal Prima Hospital, 41 patients (32%) had a history of hypertension, while 79 patients (65.8%) did not have hypertension. In the group with coronary heart disease (CHD), the proportion of patients with hypertension was much higher, at 61.7%, compared to the non-CHD group, which was only 6.7%. These results show that hypertension is a dominant condition in patients with CHD and can play a role as a major risk factor for the occurrence of coronary heart disease.

These results are in line with the epidemiological fact that hypertension is one of the most common comorbid conditions found in coronary heart disease patients. Chronically high blood pressure can cause thickening and stiffening of the artery walls as well as impaired endothelial function which ultimately accelerates the occurrence of atherosclerosis (World Health Organization, 2024).

Research in Indonesia also showed similar results. The study of Hafiza, Candra, and Lidiawati (2024) at Umi Rosnati Hospital Banda Aceh reported that most coronary heart disease patients had a history of hypertension, with the proportion reaching more than 60% of the total respondents. The same results were also reported by Ningsih and Handayani (2023) at Arifin Achmad Riau Hospital, who found that the hypertensive patient group dominated among CHD patients. These findings show that the prevalence of hypertension in the population of heart disease patients is still high in Indonesia, so blood pressure control remains the main focus in efforts to prevent cardiovascular disease.

Thus, it can be concluded that the majority of patients with coronary heart disease at Royal Prima Hospital have a history of hypertension, and these findings are consistent with the results of studies in various regions in Indonesia.

Patient Characteristics Based on Dyslipidemia Status

Based on Table 4, out of a total of 120 patients at Royal Prima Hospital, 38 patients (31.7%) had dyslipidemia and 82 patients (68.3%) did not have dyslipidemia. In the group of cases with coronary heart disease (CHD), the proportion of dyslipidemia was higher, at 51.7%, while in the non-CHD group, it was only 11.7%. This suggests that dyslipidemia is a condition that is more common in patients with CHD compared to the control group.

The findings of this study are in line with the results of the study by Hafiza et al. (2024) at Umi Rosnati Hospital, Banda Aceh, which found that 58.5% of CHD patients had high total and LDL cholesterol levels. Research by Sari and Nugroho (2024) at Dr. Kariadi Semarang Hospital also reported that dyslipidemia increased the risk of CHD by up to 3.2 times compared to patients with normal lipid profiles. In addition, Kusnadi et al. (2023) at Dr. Sardjito Hospital Yogyakarta stated that the combination of dyslipidemia and hypertension significantly increases the risk of CHD occurrence.

Thus, the higher proportion of dyslipidemias in the CHD group at Royal Prima Hospital supports the findings of various studies in Indonesia.

Patient Characteristics Based on Diabetes Mellitus Status

Based on Table 5, out of a total of 120 patients at Royal Prima Hospital, as many as 32 patients (26.7%) had a history of diabetes mellitus and 88 patients (73.3%) did not have diabetes

mellitus. In the group of patients with coronary heart disease (CHD), there were 29 patients (48.3%) with diabetes mellitus and 31 patients (51.7%) without diabetes mellitus. In contrast, in the non-CHD group, only 3 patients (5.0%) had diabetes mellitus. This shows that the proportion of patients with diabetes mellitus is much higher in the CHD group than in the non-CHD group.

The findings of this study are in line with the results of a study by Kusnadi et al. (2023) at Dr. Sardjito Hospital Yogyakarta which reported that 45% of CHD patients have a history of diabetes mellitus. Research by Hafiza, Candra, and Lidiawati (2024) at Umi Rosnati Hospital Banda Aceh also found that almost half of CHD patients are people with diabetes mellitus. In addition, Prabhaswara et al. (2024) at Dr. Hasan Sadikin Hospital Bandung showed that comorbid diabetes mellitus increases the risk of CHD incidence by up to two times compared to patients without diabetes mellitus.

Thus, the greater proportion of diabetes mellitus patients in the CHD group at Royal Prima Hospital is consistent with various studies in Indonesia that confirm that diabetes mellitus is one of the important factors that contribute to the increased risk of coronary heart disease.

Patient Characteristics Based on Obesity Status

Based on Table 6, out of a total of 120 patients at Royal Prima Hospital, 55 patients (45.8%) were obese, while 65 patients (52%) were not obese. In the group with coronary heart disease (CHD), the proportion of obesity reached 60.0%, while in the non-CHD group it was only 31.7%. This shows that the majority of CHD patients have an obese status, which means that being overweight is a common characteristic of CHD patients at the study site.

The results of this study are consistent with the Astuti and Pratama (2023) study at Dr. Moewardi Surakarta Hospital which reported that more than 50% of CHD patients were obese. Research by Putri et al. (2022) at Arifin Achmad Riau Hospital also found that 57.8% of CHD patients are classified as obese. In addition, recent research by Sari and Nugroho (2024) at Dr. Kariadi Hospital Semarang shows that obese patients have a 2.5 times greater chance of developing CHD than patients of normal weight.

Thus, the high proportion of obesity in the CHD group at Royal Prima Hospital supports the findings of various studies in Indonesia that obesity is one of the main determinants of increasing the prevalence of coronary heart disease globally.

Patient Characteristics Based on Smoking History

Based on Table 7, of the 120 patients studied at Royal Prima Hospital, 56 patients (46.7%) were active smokers and 64 patients (53.3%) did not smoke. In the group with coronary heart disease (CHD), the proportion of active smokers reached 63.3%, much higher than the non-CHD group of 30.0%. This shows that the majority of patients with CHD have a history of smoking, so smoking habits appear to be the dominant factor in coronary heart disease patients.

The results of this study are in line with the study of Prabhaswara et al. (2024) at Dr. Hasan Sadikin Hospital Bandung which found that 66% of CHD patients have a history of smoking, and this habit increases the risk of CHD incidence by up to two times compared to non-smokers. Research by Sari and Nugroho (2023) at Dr. Kariadi Hospital Semarang also showed a proportion of active smokers of 61.5% in CHD patients. Meanwhile, Isnaini and Putra (2022) reported similar results at M. Djamil Padang Hospital, where smoking was the dominant

risk factor in male CHD patients of productive age. Thus, the results of this study reinforce the evidence that smoking is the most prominent characteristic in patients with coronary heart disease.

Relationship of Risk Factors with Coronary Heart Disease Incidence

Relationship of Age Group to Coronary Heart Disease Incidence

Based on the Chi-Square test, $p = 0.001$ ($p < 0.05$) was obtained, which showed a significant relationship between age and the incidence of CHD at Royal Prima Hospital, with the proportion of CHD being much higher in the age group ≥45 years (86.7%) compared to <45 years (13.3%), so that the older the age, the higher the risk of CHD. These findings are consistent with various studies in national referral hospitals that report the age of ≥45 years as a strong predictor of CHD with a multi-fold increased risk, and in line with the WHO (2024) which states that the incidence of CHD increases sharply after the age of 40 due to decreased blood vessel function and long-term exposure to chronic risk factors.

Sex Relationship with the Incidence of Coronary Heart Disease

The results of the Chi-Square test showed $p = 0.001$ ($p < 0.05$), indicating a meaningful relationship between sex and CHD incidence, where most CHD sufferers were male (81.7%), while in the non-CHD group there were more women (58.3%). Biologically, premenopausal women are protected by the hormone estrogen that improves lipid profile and endothelial function, while men are more exposed to behavioral risk factors such as smoking, stress, alcohol, and high-fat diets. Various studies in major hospitals in Indonesia and the WHO report (2024) also show that men, especially of productive age 40–60 years, have a higher risk of CHD than women, so male sex can be considered an important risk factor for CHD.

Relationship between Hypertension and Coronary Heart Disease Incidence

The Chi-Square test showed $p = 0.001$ ($p < 0.05$), which means that there is a significant relationship between hypertension and CHD, with 61.7% of CHD patients having a history of hypertension compared to only 6.7% in the non-CHD group, so that people with hypertension have a much greater tendency to experience CHD. Pathophysiologically, chronic hypertension damages the endothelial, thickens and stiffens the walls of the arteries, as well as accelerates atherosclerosis, which ultimately disrupts coronary blood flow. Various studies in Indonesia and WHO data (2023) confirm hypertension as one of the main contributors to death due to cardiovascular disease, so blood pressure control is a key component in the prevention of CHD.

Relationship of Dyslipidemia with the Incidence of Coronary Heart Disease

The results of the Chi-Square test with $p = 0.001$ ($p < 0.05$) showed a significant relationship between dyslipidemia and CHD, where 51.7% of CHD patients experienced dyslipidemia compared to 11.7% in the non-CHD group, so that the abnormal lipid profile clearly increased the risk of CHD. Dyslipidemia, especially an increase in LDL and triglycerides as well as a decrease in HDL, accelerates the formation of atherosclerotic plaques in the coronary arteries and reduces blood flow to the myocardium. These findings are consistent with a number of studies in major hospitals in Indonesia and a WHO report (2024)

stating that high cholesterol contributes to the majority of global CHD cases, so diet, lifestyle, and hypolipidemic therapy interventions are of great importance.

Relationship of Diabetes with the Incidence of Coronary Heart Disease

The Chi-Square test showed p = 0.001 (p < 0.05), which confirmed a significant relationship between diabetes mellitus and CHD, with 48.3% of CHD patients having a history of diabetes compared to only 5% in the non-CHD group, so diabetics had a much greater risk of developing CHD. Chronic hyperglycemia in diabetes causes endothelial damage, oxidative stress, vascular dysfunction, and systemic inflammation that accelerates coronary atherosclerosis. Various studies in referral hospitals and WHO reports (2024) state that people with diabetes have a 2–4 times higher risk of developing CHD, so strict glycemic control through lifestyle changes and pharmacological therapy is an important strategy for CHD prevention.

Relationship between Obesity and Coronary Heart Disease Incidence

Based on the Chi-Square test, p = 0.002 (p < 0.05) was obtained, which shows a significant relationship between obesity and CHD, with a higher proportion of obesity in the CHD group (60.0%) than in non-CHD (31.7%), so obesity is more common in patients with CHD. Biologically, obesity contributes to insulin resistance, atherogenic dyslipidemia, hypertension, and systemic inflammation that accelerates coronary atherosclerosis. Data from WHO (2024), Riskesdas, as well as various national and international studies show that an increase in BMI, especially central obesity, is strongly correlated with an increased risk of ischemic heart disease, so weight control, physical activity, and a healthy diet are important parts of CHD prevention strategies.

Relationship of Smoking with the Incidence of Coronary Heart Disease

The results of the Chi-Square test showed p = 0.001 (p < 0.05), which indicates a significant association between smoking history and CHD, with 63.3% of CHD patients having a history of smoking compared to 30.0% in the non-CHD group, so smoking clearly increases the risk of CHD. Cigarette smoke containing nicotine, carbon monoxide, and free radicals causes endothelial dysfunction, vasoconstriction, increased blood pressure, and accelerated formation of atherosclerotic plaques. Various studies in Indonesia and WHO (2024) state that smoking is the single largest cause of CHD and is responsible for about one-fifth of cardiovascular deaths, so smoking cessation programs and protection from exposure to secondhand smoke are top priorities for CHD prevention.

Factors Affecting the Incidence of Coronary Heart Disease

Based on the binary logistics regression test, age factors ≥45 years, hypertension, dyslipidemia, diabetes mellitus, smoking history, and gender were proven to have a significant effect on the incidence of CHD at Royal Prima Hospital, with age ≥45 years being the most dominant factor (risk of about 13 times), followed by dyslipidemia (Exp(B) ±12.9), hypertension (±9.6), diabetes (±6.8), smoking (±5), and men who had a higher risk than women. Meanwhile, obesity did not have a significant effect independently after being controlled with other metabolic factors, suggesting that the impact was more mediated through hypertension, dyslipidemia, and glycemic disorders, and was in line with the concept of the "obesity paradox"

and the finding that fat distribution (central obesity) was more decisive than total BMI. Overall, these results confirm that a combination of factors of old age, metabolic disorders, smoking behavior, and male sex are the main determinants of CHD that need to be the main focus of prevention and control interventions.

CONCLUSION

Based on the results of the study on factors related to the incidence of coronary heart disease (CHD) at Royal Prima Hospital, it can be concluded that the majority of patients are ≥45 years old, male, and have a history of hypertension, dyslipidemia, diabetes mellitus, and smoking, while obesity varies. Bivariate analysis showed a significant association between age ≥45 years, dyslipidemia, hypertension, diabetes mellitus, gender, and smoking history with the incidence of CHD. Multivariate analysis confirmed that age ≥45 years was the most dominant factor influencing CHD, followed by dyslipidemia, hypertension, diabetes mellitus, smoking history, and gender, while obesity did not have a direct effect but contributed indirectly through metabolic changes that triggered an increase in blood pressure, lipids, and glucose. Based on these findings, the researchers were further advised to expand the variables through in-depth interviews related to physical activity, diet, stress, and genetic factors; health service institutions need to strengthen screening and education programs to control risk factors, especially in the age group of ≥45 years and people with comorbidities; and the public is encouraged to adopt a healthy lifestyle, maintain weight, exercise regularly, and avoid smoking to reduce the risk of CHD.

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