



ANALYSIS OF RISK FACTORS FOR THE INCIDENCE OF CORONARY HEART DISEASE

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ABSTRACT

Coronary Heart Disease (CHD) is a significant public health problem with high morbidity and mortality. Although CHD cases continue to increase in Indonesia, including in East Kalimantan, there have not been many studies that have identified specific risk factors at Kudungga Sangatta Hospital, East Kutai Regency. This study aims to analyze the risk factors for CHD incidence at Kudungga Sangatta Hospital. This study uses an analytical observational design with a case-control approach. The sample consisted of 60 cases of CHD and 60 non-CHD controls taken from outpatients at the cardiac polyclinic of Kudungga Sangatta Hospital using purposive sampling techniques. Data was collected through questionnaires and medical records. Independent variables include hypertension, family history, and hypercholesterolemia, while dependent variables are CHD incidence. The data collection techniques included a preparation stage (obtaining research permits and conducting a preliminary study), followed by an implementation stage (collecting respondent data, sorting samples according to criteria into two groups, filling out questionnaires, and collecting research instruments). Data analysis was done quantitatively using a case control design with the chi-square test to see the relationship between variables. This study found a significant association with the incidence of dengue in the following variables: hypertension ($p < 0.000$) OR 10,394, family history ($p < 0.000$) OR 7.538, and hypercholesterolemia ($p < 0.000$) OR 10.846. It can be concluded that hypertension is the most dominant risk factor affecting the incidence of coronary heart disease at Kudungga Sangatta Hospital ($\text{Exp}(\beta) = 11,311$).

Keywords: coronary heart disease; family history; hypertension; hypercholesterolemia

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INTRODUCTION

Coronary Heart Disease (CHD) is an important public health problem due to its high morbidity and mortality. According to (Lewis, 2017) Coronary Heart Disease (CHD) is a disease of the heart and blood vessels caused by narrowing of the coronary arteries. Narrowing of blood vessels occurs due to the process of atherosclerosis due to the slow accumulation of cholesterol and connective tissue on the walls of blood vessels. CHD or Coronary Heart Discharge (CHD) is characterized by blockage of the blood vessels around the heart caused by atherosclerosis. Cases with heart disease are the largest contributor to the cause of death. The incidence of heart disease in developing countries such as Indonesia The incidence rate continues to increase every year. The results of the survey from basic health research in 2018 show that the prevalence of coronary heart disease based on doctor's diagnosis in Indonesia reached 1.5%. This figure shows an increase when compared to the prevalence of the 2013 riskesdas results, which is 0.5%. Meanwhile, the rate of coronary heart disease in the East Kalimantan region ranks 5th, reaching 1.9% (Riskesdas, 2018).

Kudungga Sangatta Regional General Hospital (RSUD) is a hospital with safe and comfortable services by providing individual and plenary health services. Kudungga Hospital is a heart disease referral hospital in the East Kutai Regency area because it has more complete examination support equipment. Based on medical record data at Kudungga Sangatta Hospital from 2018-2023. The number of coronary heart disease patients who come to visit has increased every year. As of September 2023, a total of 951 patients are (Medical Records of Kudungga Sangatta Hospital, 2023). Although the cases are high, currently there has been no research related to what risk factors cause the incidence of coronary heart disease at Kudungga Sangatta Hospital. This research is very necessary considering that the incidence of disease and death due to cardiovascular disease is increasing, so the incidence of this disease must be controlled and therefore it is necessary to recognize risk factors so that the incidence of coronary heart disease in East Kutai Regency can be controlled and lowered.

However, until now, the cases of CHD recorded at the East Kutai Health Office are only Kudungga Hospital, private hospitals operating in Kutim Regency have not been properly reported. It is like an iceberg phenomenon, which is visible only a handful but the unrecorded position can be larger. To reduce the burden of coronary heart disease, a deep understanding of CHD risk factors is essential. Identification of risk factors for CHD can help in planning appropriate and effective interventions to prevent and control CHD in the community. Based on the background, the purpose of this study is to analyze the risk factors for the incidence of coronary heart disease at Kudungga Sangatta Hospital, East Kutai Regency.

METHOD

This study is an analytical observational research with a case control design or a control case study which is an epidemiological study design that studies the relationship between exposure (research factors) and diseases based on their exposure status (Dahlan, 2017). The research was carried out from January to February 2025 at Kudungga Sangatta Hospital, East Kutai Regency. Population is a generalized area consisting of subjects/subjects that are certain qualities and characteristics that the researcher determines to be studied (Dahlan, 2017). The population in this study is 2623 patients who are treated at heart polyclinics which are recorded until 2024. The sample of this study uses a non-random sampling technique, namely purposive sampling where sampling is based on criteria that have been set by the researcher. The sample of this study consisted of a group of coronary heart cases with a non-coronary heart control group. The sample size was calculated using data on the number of coronary heart patients in the case group of 60 people and the control group as many as 60 people with a ratio of 1:1. By using matching outpatients with heart disease so that the total sample size is 120 people. The data collection techniques included a preparation stage (obtaining research permits and conducting a preliminary study), followed by an implementation stage (collecting respondent data, sorting samples according to criteria into two groups, filling out questionnaires, and collecting research instruments). Data analysis was done quantitatively using a case control design with the chi-square test to see the relationship between variables.

RESULT

Table 1.
The Relationship of Hypertension with CHD Incidence

The Relationship of Hypertension with CHD Incidence								
Hypertension	CHD				Total		P-value	Odds Rasio (OR) (95% CI)
	CHD		None CHD					
	f	%	f	%	f	%		
Hypertension	49	81,7	18	30,0	67	55,8	0,000	10,394 (4,417 – 24,461)
None CHD	11	18,3	42	70,0	53	44,2		

Table 1. It is known that among respondents with hypertension, the highest proportion of respondents who experienced CHD was 49 respondents (81.7%), then in non-hypertensive respondents the highest proportion of respondents who did not experience CHD was 42 respondents (70.0%). The results of the chi-square analysis showed a p-value of 0.000 ($p < 0.05$) which means that there is a meaningful relationship between hypertension and the incidence of CHD. The odds ratio showed 10.394 (95% CI: 4.417 – 24.461) which means that respondents with hypertension were at risk of 10.394 times greater incidence of CHD compared to respondents who did not have hypertension.

Table 2.

The Relationship between Family History with CHD Incidence

The Relationship Between Family History with CHD Incidence								
Family History	CHD						<i>P-value</i>	<i>Odds Rasio (OR)</i> <i>(95% CI)</i>
	CHD		None CHD		Total			
	f	%	f	%	f	%		
Available	21	35,0	4	6,7	25	20,8	0,000	7,538 (2,400 – 23,683)
None	39	65,0	56	93,3	56	79,2		

Table 2. It is known that among respondents with a family history, the highest proportion of respondents who experienced CHD was 21 respondents (35%), then in respondents who did not have a family history the highest proportion of respondents who did not experience CHD was 56 respondents (93.3%). The results of the chi-square analysis showed a p-value of 0.000 ($p < 0.05$) which means that there is a meaningful relationship between hypertension and the incidence of CHD. The odds ratio showed 7.538 (95% CI: 2,400 – 23.683) which means that respondents with a family history were 10.394 times more at risk of experiencing CHD than respondents with no family history.

Table 3.

The Relationship of Hypercholesterolemia with CHD Incidence

The Relationship of Hypercholesterolemia with CHD Incidence								
Hypercholesterolemia	CHD						P-value	Odds Rasio (OR) (95% CI)
	CHD		None CHD		Total			
	f	%	f	%	f	%		
Hypercholesterolemia	45	75,0	13	21,7	58	48,3	0,000	10,846 (4,646 – 25,319)
None Hvoercholesterolemia	15	25,0	47	78,3	62	51,7		

Table 3. It is known that among respondents with a history of hypercholesterolemia, the highest proportion of respondents who experienced CHD was 45 respondents (75.0%), then in respondents who had no history of hypercholesterolemia the highest proportion of respondents who did not experience CHD was 47 respondents (78.3%). The results of the chi-square analysis showed a p-value of 0.000 ($p < 0.05$) which means that there is a meaningful relationship between hypertension and the incidence of CHD. The odds ratio showed 10.846 (95% CI: 4.646 – 25.319) which means that respondents who had a history of hypercholesterol were 10.846 times more likely to experience the incidence of CHD compared to respondents who did not have a history of hypercholesterol.

DISCUSSION

The results of the study at Kudungga Sangatta Hospital showed that hypertension had a very significant relationship with the incidence of CHD, with an Odds Ratio (OR) of 10,394 and a p value of < 0.001 . This means that patients with hypertension have a 10 times greater risk of developing CHD compared to those who do not have hypertension. These findings are in line with the understanding that hypertension is one of the major risk factors for cardiovascular disease, including CHD. Hypertension causes increased pressure on the artery walls, which can result in endothelial damage and trigger the process of atherosclerosis (Libby et al., 2019). Hypertension contributes to the development of CHD through several pathophysiological mechanisms. First, hypertension causes endothelial dysfunction, which is the layer of cells that line blood vessels. When blood pressure rises, the walls of the arteries are subjected to

excessive mechanical stress, which can damage endothelial cells and reduce the production of nitric oxide (NO), a substance that serves to dilate blood vessels (Schiffrin, 2021). Decreased NO levels lead to vasoconstriction, increase vascular resistance, and worsen hypertension itself.

These findings are consistent with many previous studies that have shown a strong link between hypertension and CHD. For example, the INTERHEART study involving more than 27,000 participants in 52 countries found that hypertension accounted for 54% of CHD risk, with an OR of 7.3 (Yusuf et al., 2020). Research by Ice Johanis et al. (2020) in East Nusa Tenggara also showed that hypertensive patients had a very high risk of CHD, reaching 65 times greater compared to non-hypertensive individuals. In addition, a meta-analysis by Bundy et al. (2023) showed that exposure to hypertension for more than 5 years significantly increased the risk of CHD, with a hazard ratio (HR) reaching 4.5.

The results of the study at Kudungga Sangatta Hospital showed that family history had a significant relationship with the incidence of CHD, with an Odds Ratio (OR) of 7.538 and a p value of < 0.001 . This means individuals who have a family history of CHD have a 7.5 times higher risk of developing the disease compared to those who have no family history. These findings confirm the importance of genetic and environmental factors in the development of CHD, where family history serves as a strong risk indicator. The relationship between family history and CHD can be explained through several pathophysiological mechanisms. First, genetic factors play an important role in predisposition to cardiovascular disease. Genes involved in lipid metabolism, such as PCSK9 and LDLR, can be inherited and affect cholesterol levels in the blood. Individuals with mutations in these genes tend to have higher levels of LDL, which is a major risk factor for atherosclerosis and CHD (Khera et al., 2023).

These findings are in line with many previous studies that have shown a strong link between family history and CHD. For example, research by Yulendasari et al. (2020) in Metro, Lampung, found that individuals with a family history of CHD had an OR of 7.2, suggesting that genetic and environmental factors play an important role in the development of the disease. In addition, a study by Ice Johanis et al. (2020) in East Nusa Tenggara reported that patients with a family history of CHD had a very high risk, reaching 65 times greater compared to individuals without a family history. This study confirms that family history is a significant risk indicator and can be used in CHD prevention strategies.

Hypercholesterolemia, which is characterized by high cholesterol levels in the blood, is one of the main risk factors for CHD. High levels of LDL (low-density lipoprotein) cholesterol can lead to plaque buildup in the walls of the arteries, which inhibits blood flow to the heart and increases the risk of heart attack. Research shows that individuals with a history of hypercholesterolemia have a higher risk of developing CHD. In the analysis conducted, it was found that the proportion of respondents with hypercholesterolemia who experienced CHD reached 75%, with an Odds Ratio (OR) of 10.846, which suggests that they were at 10.846 times greater risk of developing CHD compared to those who had no history of hypercholesterolemia.

Research by Mulyani et al. (2018) showed that there is a significant relationship between hypercholesterolemia and the incidence of CHD, where individuals with high cholesterol levels have a much higher risk of developing CHD. This study is in line with the results obtained in the analysis which showed a $p < 0.001$, which indicates a very

significant relationship. The consistency of these findings across populations strengthens their validity, although there are variations in the amount of risk. The study of Khirani Nurul et al. (2018) reported a lower OR (9.6), presumably due to differences in the metabolic characteristics of the sample: this study was dominated by cases with an increase in small-solid LDL (high atherogenic subtype), while other studies included more hypercholesterolemia with large-flotive LDL. This factor is significant considering recent NMR spectroscopy analysis proves that small-solid LDL particles (sdLDL) have a 3 times higher affinity to vascular intima proteoglycans than large LDL (Crombag et al., 2024). Disparities also emerge in the genetic context: Southeast Asian populations have a lower prevalence of APOE4 gene polymorphisms (10-15%) than Caucasians (20-25%), which modulates susceptibility to parent-diet hypercholesterolemia (Aung et al., 2023).

CONCLUSION

Based on the results of the study, a significant relationship was found between the incidence of Coronary Heart Disease (CHD) and risk factors such as hypertension, family history, and hypercholesterolemia. Among these three variables, hypertension was proven to be the most dominant major risk factor contributing to the incidence of CHD. These findings confirm the importance of early detection and blood pressure management as a preventive step in an effort to reduce the prevalence of CHD. In addition, attention to family history and cholesterol levels is also still needed as part of a comprehensive prevention strategy.

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