

PREVALENCE AND DETERMINANT FACTORS OF CORONARY HEART DISEASE STATUS IN PATIENTS WITH HEART FAILURE

A Cross-sectional Study at Alamanda Ward of RSUD Ulin Banjarmasin

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Abstract: *As a cardiovascular disease, heart failure is one of prime mortality cause in the world. Coronary heart disease has a role in development of heart failure so that it becomes one of heart failure's major clinical risk factor. This study aimed to calculate the prevalence of and identify the factors that influence coronary heart disease status of heart failure patients at Alamanda ward of RSUD Ulin Banjarmasin in 2016. Factors that were studied consisted of age, sex, family history of heart disease, smoking, diabetes mellitus, and hypertension. This study used analytical observation with cross-sectional approach on medical records that were obtained by purposive sampling method. The result showed 46.4% of 263 heart failure patients had coronary heart disease status. Multivariate analysis inferred hypertension as the factor that influences the coronary heart disease status of heart failure patients (OR = 1.98, 95% CI = 1.06 – 3.71, P = 0.033).*

Keywords: *cardiovascular disease, heart failure, coronary heart disease, hypertension*

INTRODUCTION

Compared with the other causes of death, cardiovascular disease has more number in term of mortality. In 2005, up to 17,5 million people die by cardiovascular disease which makes it number one in cause of death.¹ According to the data from Centers for Disease Control and Prevention (CDC), cardiovascular disease was placed as the first cause of mortality for 3 years in a row (2009 to 2011) in United States.² In Indonesian ministry of health's Domestic Health Survey 2001, the prevalence of cardiovascular disease in Indonesia reaches 4,2%.³ The same survey also shows that cardiovascular disease has 26,3% in proportion as the cause of death in Indonesia.⁴ Indonesia's Basic Health Research that was conducted by ministry of health in 2007 reveals that the prevalence of heart disease based on doctor's anamneses reaches 0,9% and based on symptoms or doctor's diagnoses reaches 7,2%. Indonesia's Basic Health Research 2007 defines the heart disease as congenital heart disease, angina, arrhythmia, and cardiac decompensation.⁵ Cardiovascular disease creates an economic burden in both the world and Indonesia through health care cost. World Health Organization estimates the global economic burden of cardiovascular disease (ischemic heart disease, stroke, and congestive heart failure) in 2010 as much as 863 billion US dollars which is projected to rise up to 1,044 billion US dollars by 2030. The total economic burden of the same disease in south east Asia region alone in 2010 is estimated as much as 30.7 billion US

dollars.⁶ The cost for Indonesian social security program to cover the health care of heart disease patients in 2012 nearly reached 23 billion rupiahs.⁷

Heart failure is the abnormality in cardiac function which results in inadequacy to pump blood and fulfill the metabolic demand of the body or able to pump blood only by increasing the diastolic pressure.⁸ Heart failure is one of main cause of mortality and disability in the world which makes it a global problem in health care. The world has more than 23 million heart failure patients and this number keeps increasing.⁹ Coronary heart disease (CHD) is a clinical condition in which its development caused by accumulation of atherosclerotic plaque in pericardial arteries, leading to myocardial ischemia.¹⁰ CHD contributes the proportion of 43% of all deaths by cardiovascular disease. Three-fourth of CHD mortality number in the world belongs to low and middle-income countries such as Indonesia.¹¹ Indonesia's Basic Health Research 2013 reveals that the prevalence of heart failure based on doctor's anamneses reaches 0,13% and based on symptoms or doctor's diagnoses reaches 0,3% whilst the prevalence of CHD based on doctor's anamneses reaches 0,5% and based on symptoms or doctor's diagnoses reaches 1,5%.¹² The prevalence of heart failure and CHD in south Borneo and city of Banjarmasin tend to follow the national prevalence.¹³ The prevalence of heart failure and CHD in Indonesia, south Borneo, and Banjarmasin are summarized in table 1.

Table 1. Prevalence of Heart Failure and CHD According to Basic Health Research 2013¹²

| | Indonesia | | South Borneo | | Banjarmasin City | |
|---------------|-----------|-----|--------------|-----|------------------|-----|
| | D | S/D | D | S/D | D | S/D |
| Heart Failure | 0,13 | 0,3 | 0,06 | 0,3 | 0,21 | 0,4 |
| CHD | 0,5 | 1,5 | 0,5 | 2,2 | 0,4 | 0,8 |

D = Doctors' anamneses

D/S = Symptoms or doctors' diagnosis

There are decreasing number of heart failure and CHD patients when comparing the patient census recapitulation of RSUD (District General Hospital) Ulin's

Alamanda ward year 2015 and 2016. The number of heart failure patients in 2015 is 520 whilst in 2016 the number is 317. For CHD, the number of patient in 2015 is 427

whilst in 2016 the number is 265. However, the position of both diseases as the mortality cause at Alamanda ward remain unchanged in both 2015 and 2016. In 2015, heart failure is placed at first position (total 29 deaths), followed by CHD (total 4 deaths) whilst in 2016 heart failure is also placed at first position (total 28 deaths) and again, followed by CHD (total 4 deaths).

Risk factor of heart failure is divided into several types such as major and minor clinical risk factors. Major clinical risk factor of heart failure consists of myocardial infarction, age, male sex, hypertension, and diabetes, whilst smoking is the example of the minor one. Family history of heart failure acts as genetic predictor in heart failure risk factor.¹⁴ As one of heart failure's risk factor, CHD also has several risk factors that is similar compared to heart failure. Its risk factor is divided into modifiable and unmodifiable risk factors. The modifiable risk factor consists of smoking, hypertension, and diabetes mellitus, whilst the unmodifiable one consists of age, sex, and family history of CHD.¹⁵ Dysfunctional contraction-relaxation activity and asynchronous contraction on ischemic part of the heart caused by CHD lead a decrease in heart's capacity to pump blood properly which in turn manifests as heart failure.^{16,17} Risk factor is important in development of a disease. Etiologically, heart failure and CHD are related, let alone if one must look at their risk factors.

Early detection and modification of cardiovascular disease risk factors is a necessity in order to slow the disease's development down and prevent its manifestation which will ultimately contribute in lowering the prevalence, mortality and morbidity, and economic burden caused by the disease. In this case, the diseases are heart failure and CHD. This study aims to count the prevalence of heart failure patients generally and specifically based on the risk factors of age, sex, family history of heart disease, smoking, diabetes mellitus, and hypertension as well as

identifying the determinant factors of CHD status in patients with heart failure at Alamanda ward of RSUD Ulin Banjarmasin in 2016.

RESEARCH METHODS

This analytical study used cross-sectional approach on medical records of heart failure patients as the sample. The samples were selected by purposive sampling method in order to match and obtain the criteria and variables (age, sex, family history of heart disease, smoking, diabetes mellitus, and hypertension) that this study needed. The inclusion criteria of the samples were namely, (1) the patients on the medical records were treated at Alamanda ward in 2016 and diagnosed with heart failure by RSUD Ulin cardiologists and (2) the medical records had a complete data that consist of patients' identities, anamneses, physical examinations, and other diagnostic tests such as ECG and laboratory results that supported the diagnoses. The study was conducted in June 2017 at Alamanda ward and medical record installation of RSUD Ulin Banjarmasin. Alamanda ward was picked since most of cardiovascular disease inpatients at RSUD Ulin Banjarmasin are treated there and this hospital has the facilities for referred cardiovascular disease patients from across the city/district in south Borneo. The collected data were tabulated into frequency distribution table and analyzed using logistic regression (multivariate analysis) with 95% confidence level in SPSS program.

RESULTS AND DISCUSSION

The study acquired 263 medical records of heart failure patients that fit in the inclusion criteria. The mean value of patients' age is 55 ± 11.69 . Based on age category, the 55-64-year-old group has the highest proportion. Male patients have a higher proportion compared to their female counterparts. Based on family history of heart disease, smoking, diabetes mellitus, and hypertension, the patients that have

none of those factors have the dominant proportion. The proportion of heart failure patients that have CHD is 46,4% (122 patients). Using multivariate analysis, the factor that is revealed to have an influence over CHD status in patients with heart

failure is hypertension (OR = 1.92, 95% CI = 0.27-0.95, P = 0.048). Baseline characteristics of the patients are summarized in table 2, and table 3 shows the results of the multivariate analysis.

Table 2. Baseline Characteristics of Heart Failure Patients at Alamanda Ward of RSUD Ulin Banjarmasin 2016

| Characteristics | With CHD (N = 122) | | | Without CHD (N = 141) | | |
|---------------------------------|-----------------------|------|--------------|--------------------------|------|---------------|
| | N | % | Mean ± SD | N | % | Mean ± SD |
| Age (year) | | | 54.75 ± 9.54 | | | 55.22 ± 13.31 |
| Age category (year) | | | | | | |
| 15-24 | 0 | 0 | | 5 | 3.5 | |
| 25-34 | 0 | 0 | | 4 | 2.8 | |
| 35-44 | 18 | 14.8 | | 18 | 12.8 | |
| 45-54 | 44 | 36.1 | | 37 | 26.2 | |
| 55-64 | 41 | 33.6 | | 46 | 32.6 | |
| 65-74 | 17 | 13.9 | | 21 | 14.9 | |
| ≥75 | 2 | 1.6 | | 10 | 7.1 | |
| Sex | | | | | | |
| Male | 82 | 67.2 | | 83 | 58.9 | |
| Female | 40 | 32.8 | | 58 | 41.1 | |
| Family history of Heart Disease | | | | | | |
| Yes | 14 | 11,5 | | 15 | 10,6 | |
| No | 108 | 88,5 | | 126 | 89,4 | |
| Smoking | | | | | | |
| Yes | 8 | 6,6 | | 3 | 2,1 | |
| No | 114 | 93,4 | | 138 | 97,9 | |
| Diabetes Mellitus | | | | | | |
| Yes | 13 | 10,7 | | 11 | 7,8 | |
| No | 109 | 89,3 | | 130 | 92,2 | |
| Hypertension | | | | | | |
| Yes | 32 | 26,2 | | 22 | 15,6 | |
| No | 90 | 73,8 | | 119 | 84,4 | |

Table 3. Determinant Factors in CHD Status of Heart Failure Patients at Alamanda Ward of RSUD Ulin Banjarmasin 2016

| Determinant Factors | OR (95% CI) | Adjusted OR (95% CI) |
|---------------------------------|---------------------------|---------------------------|
| Age | 0.91 (0.98 – 1.02) | 0.99 (0.97 – 1.01) |
| Sex | 1.43 (0.86 – 2.38) | 1.45 (0.86 – 2.44) |
| Family History of Heart Disease | 1.09 (0.50 – 2.36) | 0.95 (0.42 – 2.14) |
| Smoking | 3.23 (0.84 – 12.46) | 3.04 (0.77 – 12.04) |
| Diabetes Mellitus | 1.41 (0.61 – 3.27) | 1.43 (0.60 – 3.40) |
| Hypertension | 1.92 (1.05 – 3.53) | 1.98 (1.06 – 3.71) |

Aging is one of unmodifiable risk factor for CHD.¹⁵ This study showed no significant association between age and CHD status (OR = 0.99, 95% CI = 0.97 – 1.01, P = 0.53). Studies about factors that

influence the incidence of heart failure in acute myocardial infarction patients at dr. Saiful Anwar Public Hospital Malang by Baransyah *et al*¹⁸ and prevalence of myocardial infarction in heart failure

patients at emergency room of Rajavithi Hospital by Piyanuttapul *et al*¹⁹ also show no significance for variable of age (with mean value for age of each study is 56.78 ± 10.78 and 66.41 ± 12.52 respectively). Delima *et al*²⁰ shows that there is a significant association between age and heart disease in Indonesia based on the data taken in Basic Health Research 2007. Comparing the age category of 15-24 and ≥ 75 years old, the latter has a risk of 2.49-fold for having heart disease compared to the former. This means the increase of age is proportional to increase of heart disease risk. Meanwhile, a cohort study by Jousilahti *et al*²¹ found that there is a decrease in CHD relative risk when comparing age group 25-49, 50-59, and 60-64 years (6.25, 3.56, and 2.23 respectively) even though if one look at the number of incidence, it tended to increase. Aging is followed by vascular changes. In aging rodent models, the vascular wall got thicker and also featured endothelial dysfunction. Structural and functional impairments is also underwent in the heart's myocardium such as an increased myocyte number along with decreased of its size, prolonged contraction and action potential, and diminished contraction velocity.²² It is stated by CDC that in 2010, age group ≥ 85 years had the highest rate of hospitalization caused by CHD, followed by age group 75-84 and 65-74 years.²³ In this study, the prevalence of CHD at Alamanda ward peaked in age group 45-54 years, and declined sharply in age group 65-74 years. The contrast of data presented might be affected by the difference of life expectancy for United States and Indonesia. According to Indonesian ministry of health, life expectancy for Indonesian people reaches 70.8 years in 2015.²⁴ Meanwhile, a more developed country like United States has a higher life expectancy for its people, which is 78.8 in 2014.²⁵ Hence, this might the reason why hospitalization of CHD patients in United States is frequent in people aged ≥ 65 years.

The proportion of male heart failure patients with CHD status was higher than female ones yet the association was not significant (OR = 1.45, 95% CI = 0.86 – 2.44, P = 0.16). Study by Baransyah *et al*¹⁸ also shows no significant association for variable of sex. Meanwhile, studies by Piyanuttapul *et al*¹⁹ and Delima *et al*²⁰ showed statistically significant result regarding to sex, but there is a key difference. In Piyanuttapul *et al*'s¹⁹ study, the male patients have a higher proportion of having CHD whilst in Delima *et al*'s²⁰ study, the condition is the other way around and showed that female risk of having heart disease is 1.57 times bigger compared to male. Although the association is statistically insignificant, this study showed that there is an increased risk of having CHD in male patients as much as 1.43-fold compared to female patients. This might be affected by biological feature that female has. If one sees the hormonal factor, estrogen in female has a cardioprotective effect by lowering the levels of LDL, total cholesterol, triglyceride, and Apolipoprotein A and increasing the HDL level. Thus, the risk of atherosclerosis in cardiovascular disease is also lowered.^{26,27}

As the last unmodifiable risk factor for CHD in this study, family history of heart disease also showed no significance (OR = 0.95, 95% CI = 0.42 – 2.14, P = 0.90). Family history of heart disease in this study is defined as the history of heart failure, CHD, or combination of heart failure and CHD in patient's relatives such as parents and siblings. This result was similar to Baransyah *et al*'s¹⁸ study. Sudayasa *et al*'s²⁸ study at Bahteramas general hospital in Southeast Sulawesi conveys that there is a significant association between family history and CHD incidence. However, Sudayasa *et al*'s²⁸ study defines family history as history of premature CHD which is the CHD or myocardial infarction in patient's parents that happen before certain point of age (≤ 55 year for father, ≤ 65 year for mother). Using cohort design, Framingham off-spring study analyzes the

risk factor for cardiovascular disease of 2302 men and women with family history of premature cardiovascular disease (<55 year for father, <65 year for mother). Eight years of follow-up shows a result that cardiovascular disease risk of people having father with premature cardiovascular disease is increased by 75%, and 65% in case of mother with premature cardiovascular disease. A case control designed INTERHEART study found that there is an increased risk of myocardial infarction if (1) one parent has myocardial infarction (OR = 1,67), (2) one of the parents have myocardial infarction before reaching age of 50 (OR = 2,36), (3) both parents have myocardial infarction (OR = 2,90), and (4) both parents have myocardial infarction before reaching age of 50 (OR = 6,56).³⁰

Smoking as a part of lifestyle, can be modified to prevent the risk of CHD disease.³¹ In this study, however, the association was not significant (OR = 3.04, 95% CI = 0.77 – 12.04, P = 0.11) as study of Baransyah *et al*¹⁸ also shows. Studies by Delima *et al*²⁰ and Sudayasa *et al*²⁸ beg to differ. Smoking gives an increased risk for heart disease up to 1.44-fold.²⁰ The risk for CHD is increased up to 2.45-fold in people who smoke.²⁸ Jousilahti *et al*²¹ segregates the CHD risk by smoking between male and female. The CHD risk for male who smoke was 1.77-fold whilst for women the risk is 2.14-fold.²¹ Substances in cigarette can activate components such as NADPH oxidase, Xanthine oxidase, and eNOS which will cause endothelial dysfunction in blood vessel. Endothelial dysfunction is correlated with atherosclerosis.³² Carbon monoxide from smoking can also cause tissue hypoxia on organs such as heart that manifest in cardiovascular diseases such as CHD and heart failure.³³

Diabetes mellitus was not significant even though it gave an increased risk for CHD as much as 1.43-fold (OR = 1.43, 95% CI = 0.59 – 3.40, P = 0.43). Baransyah *et al*¹⁸ also shows no significance of

diabetes mellitus. Meanwhile, diabetes mellitus is significant in studies by Piyanuttapul *et al*¹⁹, Delima *et al*²⁰ and Jousilahti *et al*²¹. Diabetes mellitus increased the risk for heart disease by 4.06-fold.²⁰ If male and female should be separated, the relative risk of CHD incidence by diabetes mellitus is increased by 2-fold in male and 2.29-fold in female.²¹ Diabetes mellitus is an independent risk factor, which accounts for 2-4-fold increase of CHD morbidity and mortality. Seventy five percent of non-insulin dependent diabetes mellitus patients died due to vascular accidents.³⁴ Efimov A, *et al*³⁵ found that when comparing diabetic and non-diabetic CHD patients, diabetic patients have more stenosed and occluded coronary arteries. On the contrary, collateral blood vessels that is formed to meet the metabolic demand in ischemic part of the heart are found much more in non-diabetic patients. Development of atherosclerosis in diabetic patients is influenced by hyperglycemia, insulin resistance, dyslipidemia, hypercoagulability, and impaired injury response in diabetic condition.³⁶

Hypertension was the only risk factor in this study that is found statistically significant (OR = 1.98, 95% CI = 1.06 – 3.71, P = 0.033). Both Baransyah *et al*¹⁸ and Piyanuttapul *et al*¹⁹ show no significance of hypertension, yet Delima *et al*²⁰ shows that hypertension significantly gives a risk of heart disease as much as 1.44-fold. Jousilahti *et al*²¹ conveys that every 10 mmHg rise of systolic blood pressure is followed by increased risk for CHD incidence as much as 1.11-fold, for both male and female. A rise in systolic (20 mmHg) and diastolic (10 mmHg) blood pressure is correlated with increased risk for death caused by CHD and stroke as much as 2-fold.³⁷ Hypertension can accelerate atherosclerosis in coronary arteries. Atheromatous plaque can be ruptured in high pressure condition which can cause peripheral emboli or in situ thrombi at coronary vessels and

manifestation of acute coronary syndrome.³⁸ Future coronary events in hypertensive patients can be prevented by reducing the blood pressure.³⁹

Based on the finding in this study, it is then imperative for clinician to formulate a strategy to manage the blood pressure of heart failure patients, especially those with CHD status. Promotion for blood pressure control and prevention of hypertension among healthy people is also considered important since it serves as a modifiable risk factor.

CONCLUSIONS

This study found 122 CHD status from 263 heart failure patients at Alamanda ward of RSUD Ulin Banjarmasin. Hypertension is the determinant factor for CHD. Hence, it is necessary to prevent and modify hypertension as a risk factor of CHD in healthy people and effective management of blood pressure is a must for heart failure patients, especially those with CHD status.

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