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Factors Associated with the Increasing Incidence of Congestive Heart Failure

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Abstract

Introduction: Congestive heart failure (CHF) is a serious cardiovascular condition characterized by the heart's inability to pump sufficient blood to meet the body's metabolic demands and remains a leading cause of morbidity and mortality worldwide. The prevalence of CHF continues to increase globally and in Indonesia, including Pangkalpinang City, with risk factors such as advancing age, gender, hypertension, and smoking contributing significantly to disease progression. The rising number of CHF cases at Depati Hamzah General Hospital highlights the need to identify factors associated with the increase in CHF incidence.
Objective: This study aims to determine the factors associated with the increase in CHF at Depati Hamzah General Hospital, Pangkalpinang, in 2025.
Method: The research method used was quantitative with a cross-sectional approach. A sample of 169 patients was selected using quota sampling. Data were obtained through questionnaires and medical records, then analyzed using the Chi-square test with a significance level of $\alpha = 0.05$.
Result: The results showed a significant association between age ($p = 0.006$), gender ($p = 0.007$), hypertension ($p = 0.000$), and smoking ($p = 0.005$).
Conclusion: The conclusion of this study is that education about the factors of CHF plays a crucial role in preventing CHF from an early age. This includes consuming a healthy diet, exercising frequently/engaging in physical activity, quitting smoking, and regularly checking with the nearest health facility.

Keywords: age, congestive heart failure, gender, hypertension, smoking

Introduction

The circulatory system is responsible for pumping blood throughout the body and returning it to the heart. When the heart is unable to pump enough blood to supply tissues with oxygen and nutrients, a condition known as congestive heart failure (CHF) develops. Clinical symptoms of heart failure include decreased tissue perfusion and fluid overload (Brunner & Suddarth, 2015).

In 2020, the World Health Organization (WHO) reported approximately 6.7 million cases of CHF in developing countries. According to data collected by the World Health Organization in 2021, the number of deaths from heart disease reached 17.8 million, representing 32% to 38% of all deaths worldwide (WHO, 2021). Globally, cardiovascular disease remained the leading cause of death in 2022, according to data from the World Health Organization. Each year, 17.9 million people die from cardiovascular disease. Heart failure accounts for 85% of deaths among people with cardiovascular disease (WHO, 2022). According to the Pan American Health Organization, heart disease is a leading cause of death and disability in the Americas, with 78.7 deaths per 100,000 people suffering from CHF (Pan American Health Organization, 2021).

Heart disease is a leading killer worldwide, and in Indonesia, according to data from the Indonesian Ministry of Health. In 2021, the number of heart disease cases reached 12.93 million, increasing to 15.5 million in 2022. The number of heart disease cases also increased in 2023, reaching 20.04 million (Ministry of Health, RI 2023). According to the 2018 Basic Health Research (Riskesdas) data from the Indonesian Ministry of Health, the prevalence of CHF in Indonesia was around 1.5%, or approximately 1,017,290 people. Bangka Belitung ranks 29th in Indonesia for CHF cases, with an estimated 5,592 people (Riskesdes, 2018). According to the Indonesian Health Survey, Bangka Belitung ranked 9th in 2023 with 4,763 patients (SKI, 2023).

According to the Pangkalpinang City Provincial Health Office, the number of CHF cases in 2021 was 297, decreased to 194 in 2022, and increased to 252 in 2023 (Pangkalpinang City Health Office, 2023). Congestive Heart Failure (CHF) is among the ten most common diseases, ranking fifth at Depati Hamzah Regional Hospital in Pangkal Pinang City, with 140 cases in 2022, 151 in 2023, and 169 in 2024. (Pangkalpinang Regional General Hospital Medical Record). The etiology of congestive heart failure (CHF) primarily involves myocardial pathology, including coronary artery disease, myocarditis, and cardiomyopathy. When anatomical and functional defects of the heart reduce its capacity to meet the body's tissue nutrient and oxygen needs, symptoms such as dyspnea appear in people with heart failure (Sulastini et al., 2018 in Utami & Afni, 2023). Age is a contributing factor to Congestive Heart Failure (CHF).

Research by Silvia et al. (2025) shows that age influences the risk of heart failure. The likelihood of heart failure increases sixfold after age 40. A higher risk of cardiovascular disease is associated with aging, which is a major contributor to the decline in heart function. Known risk factors for cardiovascular disease are progressively linked to structural and functional changes in the arteries. Molecular and physiological changes result in stiffness and thickness of the blood vessel walls, along with other vascular problems that disrupt vascular tone and endothelial function. A compromised aortic and arterial system may lead to atherosclerosis, a contributing factor to heart failure.

Besides age, gender is also a contributing factor to CHF. Research by Murda et al. (2023) showed that risk variables in CHF patients yielded consistent findings, revealing that the majority of heart failure cases occurred in female patients (53.3%). Most of the female

respondents interviewed were over 45 years old, with a large proportion experiencing menopause.

Women with congestive heart failure generally experience a decreased quality of life compared to men. In this regard, normal brain natriuretic peptide (BNP) levels are elevated in women compared to men. BNP is a biomarker often used to detect patients exhibiting symptoms of heart failure and to stratify those at risk.

According to research by Rahmadon et al. (2024), hypertension is a risk factor for congestive heart failure, as it is considered a major cause of coronary artery disease. The etiology of heart disease in hypertension is persistently high blood pressure, and individuals with a history of hypertension should regulate their physical activity and lifestyle to avoid excessive stress on heart function.

According to research by Kyalalona et al. (2024), there is a significant link between smoking and CHF. Chemicals found in tobacco affect the endothelium of blood vessels, increasing blood pressure, leading to increased cardiac workload. Tobacco chemicals cause a decrease in the volume of oxygen in the blood, which flows to the heart and causes vasoconstriction. Nicotine causes the formation of reactive oxygen species (ROS), which contribute to cell damage or endothelial cell necrosis. Furthermore, adhesion molecules and activated macrophages contribute to endothelial thickening and the digestion of freely circulating lipids in blood vessels bound to the vascular throttle. If this condition persists for a prolonged period, the heart decompensates and develops CHF.

In a preliminary survey conducted by researchers through interviews with two patients on December 23, 2024, it was determined that the first patient was a 62-year-old woman with a blood pressure of 180/89 mmHg and a nonsmoker. The second patient was a 58-year-old man with a blood pressure of 160/80 mmHg and a moderate smoker. Based on the data above, it can be seen that there is an increase in the number of visits by patients with CHF who seek treatment at Depati Hamzah General Hospital, Pangkalpinang from year to year due to factors such as age, gender, hypertension, and smoking, so the author is interested in researching "Factors Associated with the Increase in Congestive Heart Failure (CHF) at Depati Hamzah Hospital, Pangkalpinang in 2024".

Objective

This study aims to determine the factors associated with the increase in CHF at Depati Hamzah General Hospital, Pangkalpinang, in 2025.

Method

This study employed a quantitative research design with a cross-sectional approach to identify factors associated with the increase in congestive heart failure (CHF) at Depati Hamzah General Hospital, Pangkalpinang, in 2025. The cross-sectional design was used to examine the relationship between independent variables and the occurrence of CHF at a single point in time.

The study population consisted of patients who sought treatment at Depati Hamzah General Hospital during the study period. A total of 169 respondents were included as samples using a quota sampling technique, based on predetermined inclusion criteria. The inclusion criteria were patients diagnosed with congestive heart failure who were willing to participate in the study and whose medical records were complete. Patients with incomplete medical records or who were unable to provide information were excluded from the study.

Data were collected using structured questionnaires and secondary data obtained from patients' medical records. The questionnaires were used to collect information related to demographic characteristics and behavioral factors, including age, gender, smoking status, and history of hypertension. Medical records were used to confirm the diagnosis of congestive heart failure and clinical characteristics of the respondents.

Data analysis was conducted through univariate and bivariate analysis. Univariate analysis was used to describe the distribution of respondents based on age, gender, hypertension status, smoking behavior, and the occurrence of CHF. Bivariate analysis was performed to determine the relationship between independent variables and the increase in CHF using the Chi-square test. The level of statistical significance was set at a p-value of less than 0.05 ($\alpha = 0.05$).

Result

Table 1. The relationship between variables

Age	**Increase in CHF**						**p (value)**	**POR (95% CI)**
	Not Occurring		**Occurring**		**Total**			
	n	**%**	**n**	**%**	**n**	**%**		
Early Adulthood	13	65.0	7	35.0	20	100	0.006	8.357 (2.09-34.595)
Late Adulthood	4	18.2	18	81.1	22	100		
Gender	**Increase in CHF**						**p (value)**	**POR (95% CI)**
	Not Occurring		**Occurring**		**Total**			
	n	**%**	**n**	**%**	**n**	**%**		
Males	12	66.7	6	33.3	18	100	0.007	7.600 (1.894-30.499)
Females	5	20.8	19	79.2	24	100		
Hypertension	**Increase in CHF**						**p (value)**	**POR (95% CI)**
	Not Occurring		**Occurring**		**Total**			
	n	**%**	**n**	**%**	**n**	**%**		
Non-hypertension	15	83.3	3	16.7	20	100	0.000	55.000 (8.179-369.849)
Hypertension	2	8.3	22	91.7	22	100		
Smoking	**Increase in CHF**						**p (value)**	**POR (95% CI)**
	Not Occurring		**Occurring**		**Total**			
	n	**%**	**n**	**%**	**n**	**%**		
Non-smokers	15	60.0	10	40.0	20	100	0.005	11.250 (2.100-60.267)
Smokers	2	11.8	15	88.2	22	100		

Table 1 analysis showed a significant relationship between age and the increase in congestive heart failure (CHF) at Depati Hamzah Regional General Hospital, Pangkalpinang, in 2025. The absence of CHF was more frequently observed in early adulthood (65.0%), whereas the occurrence of CHF was higher among individuals in late adulthood (81.1%). The Chi-square

test produced a p-value of 0.006, which was lower than the significance level of 0.05, indicating a statistically significant association. Further analysis revealed a prevalence odds ratio (POR) of 8.357 (95% CI: 2.019–34.595), suggesting that individuals in late adulthood were 8.357 times more likely to experience an increase in CHF compared to those in early and middle adulthood.

Gender was also found to be significantly associated with the increase in CHF at Depati Hamzah Regional General Hospital, Pangkalpinang, in 2025. The absence of CHF was more common among males (66.7%), while the occurrence of CHF was higher among females (79.2%). The Chi-square test yielded a p-value of 0.007, indicating a statistically significant relationship between gender and the increase in CHF. The prevalence odds ratio was 7.600 (95% CI: 1.894–30.499), demonstrating that females had a 7.6-fold higher risk of experiencing an increase in CHF compared to males.

The analysis demonstrated a strong and significant association between hypertension and the increase in CHF at Depati Hamzah Regional General Hospital, Pangkalpinang, in 2025. Most non-hypertensive respondents did not experience CHF (83.3%), whereas the majority of hypertensive respondents experienced CHF (91.7%). The Chi-square test resulted in a p-value of 0.000, indicating a highly significant relationship. Further analysis showed a prevalence odds ratio of 55.000 (95% CI: 8.179–369.849), suggesting that individuals with hypertension were at a substantially higher risk of developing CHF compared to those without hypertension.

Smoking behavior was significantly associated with an increase in CHF at Depati Hamzah Regional General Hospital, Pangkalpinang, in 2025. The absence of CHF was more commonly observed among non-smokers (60.0%), while the occurrence of CHF was predominantly found among smokers (88.2%). The Chi-square test yielded a p-value of 0.005, indicating a statistically significant relationship between smoking and the increase in CHF. The prevalence odds ratio was 11.250 (95% CI: 2.100–60.257), indicating that smokers had an 11.25 times greater risk of experiencing an increase in CHF compared to non-smokers.

Discussion

Based on the chi-square test, this study obtained a p-value of 0.006 < α (0.05), indicating a relationship between age and the increase in CHF at Depati Hamzah General Hospital, Pangkalpinang, in 2025. This study aligns with research conducted by Herlina & Suryani (2022) with 53 respondents regarding the relationship between age and the incidence of heart failure at Dr. Sardjito General Hospital, Yogyakarta, in 2022. They concluded that there was a relationship between age and the incidence of heart failure with a p-value of 0.008. As age increases, the risk of CHF increases significantly. This is caused by physiological and structural changes in the cardiovascular system due to the aging process, such as decreased blood vessel elasticity, decreased ventricular function, and an increased prevalence of comorbidities such as hypertension and diabetes. This is also supported by research conducted by Yuliana & Sari (2023) with 48 respondents regarding factors associated with increased heart failure in the West Java Regional Health Center in 2023. They concluded that there was a relationship between age and increased heart failure (p=0.007). Elderly individuals are at higher risk of developing CHF due to the degenerative processes that occur in the heart and blood vessels with age. This condition is exacerbated by the high prevalence of comorbidities in older age, indicating that the older a person is, the higher the likelihood of developing CHF.

Based on the explanation above, researchers argue that age is related to increased CHF, with advanced age being an important risk factor in the development of congestive heart

failure (CHF). With increasing age, heart function declines and structural changes increase susceptibility to cardiovascular disorders. Therefore, increasing age directly contributes to the high prevalence of CHF, especially in the elderly.

Based on statistical testing using the chi-square test, this study obtained a p-value of 0.007 <α (0.05), indicating a relationship between gender and the increase in CHF cases at Depati Hamzah Regional General Hospital, Pangkalpinang, in 2025.

This study aligns with research conducted by Indrawati & Fitria (2023) with 34 respondents regarding the relationship between gender and the increase in CHF cases at a heart specialist clinic in Yogyakarta in 2023. They concluded that there was a relationship between gender and the increase in CHF cases with a p-value of 0.011. Men tended to experience CHF more frequently with impaired cardiac pumping function (systolic dysfunction), while women more frequently experienced CHF with impaired cardiac filling (diastolic dysfunction), especially after menopause due to decreased estrogen levels. These physiological and hormonal differences cause variations in the prevalence, symptoms, and response to CHF treatment, suggesting that gender is an important determinant in the management and prevention of CHF. This is also supported by research conducted by Arumsari & Hasanah (2023) with 62 respondents on factors influencing the increase in heart failure at Moewardi Regional Hospital in 2023, which concluded a relationship between gender and the increase in heart failure (p=0.009). Gender differences contribute to variations in the incidence patterns and clinical characteristics of CHF patients, with men being more susceptible to heart failure with impaired heart contraction (systolic dysfunction), while women are more likely to experience impaired heart relaxation (diastolic dysfunction), particularly after menopause.

Based on the explanation above, researchers believe that gender is related to the increase in CHF because gender is significantly associated with the increased incidence of congestive heart failure. Men tend to experience predominantly systolic dysfunction, while women are more susceptible to diastolic heart failure, particularly after menopause. This difference shows the importance of a gender-based approach in efforts to prevent, detect early, and manage CHF disease more optimally.

Based on the statistical test with the chi-square test in this study, the p-value obtained was 0.000 <α (0.05), this indicates a relationship between hypertension and the increase in CHF disease in 2025. This study is in line with research conducted by Afriani & Yuliani (2024) with 46 respondents, regarding the relationship between hypertension and the incidence of heart failure in the elderly at Dr. M. Djamil Padang General Hospital in 2024, which concluded there was a relationship between hypertension and the incidence of heart failure in the elderly with a p-value of 0.001. Unadequately managed high blood pressure causes structural and functional changes in the heart, such as increased ventricular wall thickness and impaired myocardial relaxation, which in the long term weakens the heart's ability to pump blood effectively. This is also supported by research conducted by Trisnawati & Gemilang (2023) with 36 respondents, regarding the relationship between hypertension and an increased incidence of congestive heart failure at Pertamina Bintang Amin Hospital in Lampung Province in 2023. They concluded a relationship between hypertension and an increased incidence of congestive heart failure (p=0.000). Hypertension is not only a risk factor but also a primary trigger for structural changes in the heart that lead to heart failure. Therefore, optimal early blood pressure control is crucial in reducing the incidence of CHF, especially in the elderly and other high-risk groups.

Based on the explanation above, researchers believe that hypertension is closely related to the increase in CHF because elevated blood pressure causes a continuous increase in the heart's workload, resulting in thickening of the heart muscle, impaired filling, and ultimately decreased cardiac efficiency. This condition accelerates the development of ventricular dysfunction, the main characteristic of CHF. Therefore, hypertension is an important determinant in the process of developing heart failure, which emphasizes the need for comprehensive hypertension management as a preventive measure against the development of CHF.

Based on the explanation above, researchers argue that smoking is related to an increase in CHF disease, where smoking has been proven to have a close relationship with an increased risk of congestive heart failure (CHF), both directly through toxic mechanisms to heart tissue, and indirectly through its contribution to other cardiovascular diseases such as hypertension and atherosclerosis. Therefore, smoking is a significant causal factor in the pathogenesis of CHF and needs to be a primary focus in efforts to prevent and promote heart health.

Conclusion

This study concludes that age, gender, hypertension, and smoking are significantly associated with the increase in congestive heart failure (CHF) at Depati Hamzah Hospital, Pangkalpinang, in 2024. Advancing age and female gender were found to be important demographic factors related to the rising incidence of CHF, while hypertension and smoking emerged as major modifiable risk factors contributing to the development of the disease. These findings highlight the importance of early detection and targeted prevention strategies focusing on lifestyle modification and cardiovascular risk management to reduce the burden of CHF.

Conflict of Interest

No declare.

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