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Trends in Distribution and Case Fatality Rates of Cardiovascular Disease in West Nusa Tenggara General Hospital for 2014-2022

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Abstract: Cardiovascular disease (CVD) is the leading cause of death, which affects 17.9 million people every year. This study aimed to determine trends in CVD distribution and case fatality rate (CFR) at the West Nusa Tenggara Province General Hospital, the major referral hospital in West Nusa Tenggara Province of Indonesia. This study was descriptive with a retrospective approach using medical records of patients with CVD at the West Nusa Tenggara General Hospital from January 2014 to December 2022. Consecutive sampling was performed. Data based on diagnosis, patient age, gender, and case fatality rates were analyzed descriptively and expressed in frequency and percentage distribution. Of the 11,742 patients included, more than half of the patients (58.92%) were male. In this study, the most common CVD was ischemic heart disease (IHD) (44.23%, n=5,194), followed by patients with hypertension (24.55%, n=2,883), and heart failure (19.30%, n=2,265) which were dominated by males, 68.34%, 57.25%, and 50.53%, respectively. Females were lower in those CVD due to estrogen hormone which has role as cardio protector that maintains the elasticity of blood vessels and prevents atherosclerosis. Meanwhile, mitral valve disease is the fourth most common CVD, approximately 6.69%, followed by atrial fibrillation or atrial flutter at 5.97%, which were dominated by females, 57.78% and 54.17%, respectively. Our data showed that the highest CFR was in patients with atrial fibrillation or atrial flutter, which was 17.5% in 2022. IHD is the most found in most patients with CVD. The highest fatality rate is in atrial fibrillation or atrial flutter. CVD prevalence, or CFR, is essential to focus on treatment and prevention strategies.

Keywords: Case fatality rate; Cardiovascular; Distribution.

Introduction

Indonesia is one of the countries in the world that is facing health problems. These health problems are no longer a double disease burden but have developed into a triple disease burden. The three burdens of disease in question are infectious diseases which have not been completely resolved, non-communicable diseases (NCD) which are starting to be suffered by many people, and the emergence of new diseases that have never existed before (Depkes RI, 2007).

Data from the World Health Organization (WHO) in 2022 states that the mortality rate in the NCD group in the world will increase from year to year. NCDs kill 41 million people every year, equivalent to 74% of all deaths globally. Every year, 17 million people die from NCDs before the age of 70; 86% of these premature deaths occur in low- and middle-income countries. Of all NCD deaths, 77% were in low- and middle-income countries. The number of deaths due to NCDs in Indonesia is 1,386,000 people (WHO, 2022).

The type of disease that contributes to the highest mortality rate in the non-communicable disease group is

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cardiovascular disease. Cardiovascular disease is a disease caused by both heart and blood vessels experiencing problems and unable to function normally, causing diseases such as coronary heart disease, rheumatic heart disease, congenital heart disease, stroke and hypertension (WHO, 2022). Cardiovascular disease is the leading cause of death from NCDs, or 17.9 million people every year, followed by cancer (9.3 million), chronic respiratory disease (4.1 million), and diabetes (2.0 million including deaths due to kidney disease which caused by diabetes). The prevalence of cardiovascular disease in Indonesia according to 2018 Basic Health Research data is around 1.5% and in West Nusa Tenggara Province it is around 0.8%. This figure is also expected to increase from year to year (Riskesdas, 2018). Based on this background, researchers wanted to get new insight regarding distribution and case fatality rate of cardiovascular disease in West Nusa Tenggara Province. So, this study aimed to determine the distribution and case fatality rates of cardiovascular disease in West Nusa Tenggara General Hospital in 2014-2022.

Method

This research was a descriptive study with a retrospective approach using medical record data of cardiovascular disease patients in the West Nusa Tenggara General Hospital for the period January 2014–December 2022. This study has been approved by the research ethics commission of West Nusa Tenggara Province General Hospital with ethical number 070.1/80/KEP/2022.

The Inclusion criteria were patients who came to the West Nusa Tenggara Province General Hospital with a diagnosis of cardiovascular disease and complete medical record data. The exclusion criteria were patients who came to the West Nusa Tenggara Province General Hospital with a diagnosis of cardiovascular disease and incomplete medical record data. Sampling was carried out using the consecutive sampling method, where all subjects who came and met the criteria were included in the study.

Research variables consisted of disease diagnosis, patient age, patient gender, and case fatality rate. Disease diagnosis was divided into five categories, namely ischemic heart disease, heart failure, hypertension, mitral valve disease, and atrial fibrillation or atrial flutter. The age groups were subdivided into age 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, and 75-79. The case fatality rate (CFR) was calculated by the total number of deaths divided by the total number of officially confirmed (diagnosed) cases multiplied by 100, to give a percentage. The data obtained was analyzed descriptively using the Microsoft Office Excel program, then presented in the form of frequency distribution table**.**

Result and Discussion

Of the 11,742 patients included, more than half of the patients (58.92%) were male (n=6,919), most were diagnosed with ischemic heart disease (44.23%, n=5,194) followed by patients with hypertension (24.55%, n=2,883), and patients with heart failure (19.30%, n=2,267) (Table 1). Cardiovascular disease patients with ischemic heart disease, heart failure, and hypertension were dominated by male, 68.34%, 57.26%, 50.53%, respectively. Meanwhile, female was dominated in mitral valve disease and atrial fibrillation or atrial flutter, 57.78% and 54.17%, respectively (Table 2). The largest age range of patients being 55–59 years (16,97%, n=1,993) (Table 3). The highest fatality rate was in patients with atrial fibrillation or atrial flutter at 17.5% in 2022 (Table 4, Figure 1).

Table 1. General data on the number of patients visiting the heart clinic with cardiovascular disease at the West Nusa Tenggara Province General Hospital from 2014 to 2022

Disease	Year									Total
Diagnosis	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Ischemic Heart	106	1,193	1,039	711	688	569	285	278	325	5,194
Disease	(2.04%)	(22.97%)	(20.01%)	(13.69%)	(13.25%)	(10.95%)	(5.49%)	(5.35%)	(6.26%)	(47.03%)
Heart failure	37	620	583	262	253	202	103	101	106	2,267
	(1.63%)	(27.35%)	(25.72%)	(11.56%)	(11.16%)	(8.91%)	(4.54%)	(4.45%)	(4.67%)	(20.53%)
Hypertension	62	634	487	443	381	361	194	193	138	2,883
	(2.15%)	(21.99%)	(16.89%)	(15.36%)	(13.21%)	(12.52%)	(6.73%)	(6.69%)	(4.79%)	(26.11%)
Mitral Valve	15	155	174	96	111	68	39	39	42	739
Disease	(2.03%)	(20.97%)	(23.54%)	(12.99%)	(15.02%)	(9.2%)	(5.28%)	(5.28%)	(5.68%)	(6.69%)
Atrial	8	154	143	86	78	77	37	36	40	659
Fibrillation	(1.21%)	(23.37%)	(21.7%)	(13.05%)	(11.84%)	(11.68%)	(5.61%)	(5.46%)	(6.07%)	(5.97%)
and Atrial										
Flutter										
Total	228	2,756	2,426	1,598	1,511	1,277	658	647	651	11,742
	(1.94%)	(23.21%)	(20.66%)	(13.61%)	(12.87%)	(10.87%)	(5.60%)	(5.51%)	(5.54%)	

Table 2. Patients with cardiovascular disease at the West Nusa Tenggara General Hospital for the period 2014 – 2022 based on gender.

Disease Diagnosis	Gender		Total
	Male n (%)	Female n (%)	n (%)
Ischemic Heart Disease	3,550 (68.34%)	1,644 (31.66%)	5,194 (47.03%)
Heart failure	1,298 (57.26%)	969 (42.74%)	2,267 (20.53%)
Hypertension	1,457 (50.53%)	1,426 (49.47%)	2,883 (26.11%)
Mitral Valve Disease	312 (42.22%)	427 (57.78%)	739 (6.69%)
Atrial Fibrillation and Atrial Flutter	302 (45.83%)	357 (54.17%)	659 (5.97%)
Total	6,919 (58.92%)	4,826 (41.08%)	11,742(100%)

Table 3. Patients with cardiovascular disease at the West Nusa Tenggara General Hospital for the period 2014 – 2022 based on age.

Disease Diagnosis	Age										
	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Ischemic Heart Disease	26 (0.5%)	52 (1%)	108 (2.08%)	279 (5.37%)	555 (10.68%)	783 (15.07%)	1002 (19.29%)	943 (18.15%)	691 (13.3%)	406 (7.82%)	176 (3.39%)
Heart failure	50 (2.2%)	53 (2.34%)	102 (4.5%)	158 (6.97%)	197 (8.69%)	305 (14.45%)	371 (16.36%)	357 (15.74%)	238 (10.5%)	164 (7.23%)	80 (3.53%)
Hypertension	20 (0.7%)	40 (1.4%)	73 (2.53%)	150 (5.2%)	265 (9.19%)	409 (14.19%)	467 (16.2%)	544 (18.87%)	409 (14.19%)	279 (9.68%)	141 (4.89%)
Mitral Valve Disease	46 (6.22%)	47 (6.36%)	54 (7.31%)	90 (12.18%)	69 (9.34%)	67 (9.07%)	64 (8.66%)	58 (7.85%)	32 (4.33%)	27 (3.65%)	15 (2.03%)
Atrial Fibrillation and Atrial Flutter	13 (1.97%)	25 (3.79%)	42 (6.37%)	62 (9.41%)	69 (10.47%)	66 (10.01%)	89 (13.5%)	104 (15.78%)	57 (8.65%)	56 (8.5%)	29 (4.4%)

Table 4. Case fatality rate data.

Disease Diagnosis	Year								
	2014	2015	2016	2017	2018	2019	2020	2021	2022
Ischemic Heart Disease	11.7%	6.4%	6%	7.4%	8.5%	9.3%	9.2%	8%	11.3%
Heart failure	7.8%	9%	8.3%	8.9%	9.6%	8.9%	11.5%	10.4%	11.4%
Hypertension	10.1%	12.9%	8.6%	11%	12.9%	9.7%	7.1%	14.7%	11.1%
Mitral Valve Disease	2.7%	5.8%	2.7%	2.8%	4.8%	5.4%	6.7%	3.8%	11.1%
Atrial Fibrillation or Atrial Flutter	8.1%	8.1%	9.2%	9.8%	11.7%	10.2%	8.6%	11.1%	17.5%

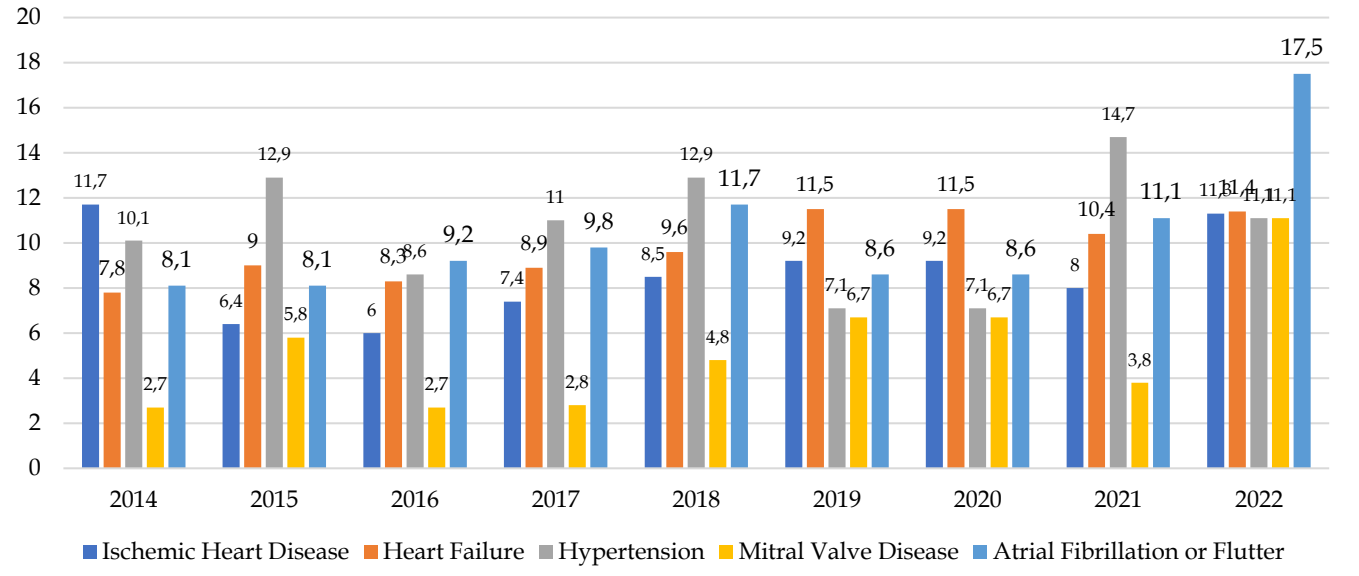

Figure 1. Trends of Case Fatality Rate

The results of research found that the highest number of disease diagnoses were patients with ischemic heart disease, followed by patients with hypertension, and heart failure patients. Based on 2016 World Health Organization (WHO) data, cardiovascular disease is the number 1 cause of death globally. Ischemic heart disease is a disease caused by plaque that builds up in the coronary arteries that supply oxygen to the heart muscle (WHO, 2016).

Most subjects who experienced cardiovascular disease in this study were male. This is in line with research, in Saudi Arabia in 2022 where cardiovascular disease occurs more often in men (64.7%) than in women (35.3%) (Alyami, et al., 2000). A descriptive study in Slovenia in 2016 also found that males (64.8%) were more dominant in experiencing CVD than females (35.2%) (Tusek, et al., 2016). What can explain these results is that the process of cardiovascular disease in women may be delayed due to the potential protective effect of estrogen against coronary atherosclerosis until menopause (Yang, et al., 2021).

Women are more susceptible to cardiovascular disease after experiencing menopause due to a decrease in the hormone estrogen (Syalfina, 2017). Hormone estrogen is a cardioprotector which maintains the elasticity of blood vessels and prevents atherosclerosis (Murphy, 2011). In addition, several risk factors for cardiovascular disease such as smoking habits, dyslipidemia, diabetes mellitus are reported to be lower in women (Bots, 2017). Cardiovascular disease can occur in both men and women, especially in women who have gone through menopause. Therefore, both are advised to continue monitoring their health, especially in terms of maintaining a healthy lifestyle, such as regular exercise, increasing consumption of fibrous foods (vegetables and fruit), drinking more water, avoiding cigarette smoke, and not drinking alcoholic beverages.

The results of this study show that most respondents were aged 55-59 years. One study in Indonesia said that cardiovascular disease in people under the age of 50 is only 1% but continues to increase with age in people over the age of 50. Increasing age has a significant effect on the heart and arterial system, leading to cardiovascular disease. Aging of cardiovascular tissue involving pathological changes, including hypertrophy, changes in left ventricular diastolic function, and decreased left ventricular systolic capacity; increased arterial stiffness; and impaired endothelial function. Cardiovascular disease can worsen if the respondent has entered the risk factors over the age of 40 but does not adopt a healthy lifestyle such as adjusting diet, regular exercise activities, and maintaining blood pressure within the normal range (Putri, et al., 2020).

Over the age of 65 years, the tissue's ability to repair itself or replace and maintain its normal function will gradually disappear so that it cannot withstand infections and repair damage to the heart and other body organs. Increasing age is related to the increase in time used for the process of deposition of fat on the walls of blood vessels so that the heart's ability to circulate blood will be slowed down by the deposition of fat so that the heart is no longer strong enough to pump enough blood to meet the needs of myocardial tissue and other organ system tissues. The process of decreasing the anatomical function of the heart will occur with increasing age (Mirza, et al., 2018).

In 2019, there were an estimated 5.8 million new cases of ischemic heart disease in the 57 ESC member countries. The estimated average incidence by age per 100,000 people was 293 (Riskesdas, 2018). In 2016, ischemic heart disease ranked first as a cause of death in the world and this ranking has not changed since 2000 (Byrne et al., 2023). Ischemic heart disease is also the first cause of death for high, middle and lower income countries (Byrne et al., 2023). Based on basic health research data, the prevalence of coronary heart disease in Indonesia in 2013 was 0.5% or estimated around 883,447 people (based on doctor's diagnosis), while based on doctor's diagnosis/symptoms it was 1.5% or estimated around 2,650,340 people (Riskesdas, 2018). The Association of Indonesian Cardiovascular Specialists explained a new study conducted by the ARIC Community Surveillance Study 2018 regarding acute myocardial infarction (AMI) patients in the United States. Research conducted from 1995-2014 resulted in the statement that 30% of the heart diseases studied had attacked young people aged 35-54 years and the annual incidence of heart disease showed an increase in young women compared to young men. According to the Indonesian Ministry of Health, in 2013 the prevalence of ischemic heart disease in Indonesia based on estimated numbers by gender showed that it was around 352,618 for men, and 442,674 for women. Based on age, the highest prevalence is in the population aged 65-74 years (3.6%), which means that among 100 people 3.6 suffer from ischemic heart disease (Byrne et al., 2023).

According to ESC data, currently, the incidence of heart failure in Europe is around 3/1000 people per year (all age groups) or around 5/1000 people per year in adults (McDonagh et al., 2021). The prevalence of heart failure appears to be 1-2% of adults. According to 2017 American Heart Association (AHA) data, heart failure affects approximately 6.5 million Americans aged 20 years and over (McDonagh et al., 2021). The incidence of heart failure in men doubles for every 10-year increase in age between ages 65 and 85 years, while in women between ages 65 to 74 years and ages 75 to 85 years it triples (McDonagh et al., 2021). Women tend to

experience heart failure at an older age than men (McDonagh et al., 2021). Based on basic health research data in 2013, the prevalence of heart failure in Indonesia based on doctor's diagnosis was (0.13%) and heart failure based on diagnosis or symptoms was 0.3%. The highest number of heart failure sufferers aged 65-74 years is around (0.5%) diagnosed by a doctor, and the lowest is around (0.4%) aged > 75 years. 3 The gender prevalence of heart failure sufferers is higher in women (0.2%) than men (0.1%) (Riskesdas, 2013).

According to ESC data, the global prevalence of hypertension was estimated at 1.13 billion in 2015, with a prevalence of more than 150 million in central and eastern Europe. The overall prevalence of hypertension in adults is approximately 30 − 45% (Benjamin, et al., 2017; and Williams, et al., 2018). Based on the National Health Examination Survey (NHANES) covering 2011-2014, it was revealed that 34% of adults in the US aged 20 years and over suffer from hypertension (Benjamin, et al., 2017). Until the age of 45 years, the percentage of men suffering from hypertension is higher than women; from ages 45 to 64, the percentages are almost the same for men and women. Over the age of 64 years, the percentage of women suffering from hypertension is higher than men (Benjamin, et al., 2017; Williams, et al., 2018; and Timmis, et al., 2022). Based on the 2013 Basic Health Research, the prevalence of hypertension in the population aged 18 years and over in Indonesia is 25.8% (Riskesdas, 2018) The prevalence of hypertension is 29% at ages 25-44 years, at ages 45-64 years it is 51% and at ages > 65 years it is 65%. Compared to ages 55-59 years, at ages 60-64 years there was an increase in the risk of hypertension by 2.18 times, at ages 65-69 years 2.45 times and at ages > 70 years 2.97 times (Mills, et al., 2020; and Iqbal, et al., 2023). Basic Health Research in 2018 reported that at age 65 and over, the prevalence of hypertension in women was 28.8, higher than men whose prevalence reached 22.8 (Riskesdas, 2018). In this study, we found that hypertension sufferers were slightly dominated by men, while in age groups, on average hypertension sufferers were dominated by the 60–64 year age group.

In this study, patients with atrial fibrillation had the highest case fatality rate in 2022. AF is associated with an increased risk of mortality after adjusting for cardiovascular comorbidities (Benjamin, et al., 1998). This is in line with population-based study in South Korea that patients with AF had a 3.67-fold higher risk of all-cause death than an age- and sex-matched general population. The leading cause of AF-associated deaths was diseases of the circulatory system, and cerebral infarction was the most common cause of death. Patients with AF showed a 5.5-fold higher risk of death due to diseases of the circulatory system than the general population (Lee, et al., 2018).

This study has several limitations. First, this research uses secondary data obtained from the West Nusa Tenggara General Hospital medical record data. Errors in writing patient data and the patient's diagnosis can occur when collecting data in medical records. Second, there is no data distribution on several disease diagnoses (aortic aneurysm and dissection, congenital malformations of the semptum and large blood vessels of the heart) regarding gender, age, etc. Third, it is possible that one patient may have more than one disease diagnosis, and what is counted in the medical record data system is only the patient's primary (main) diagnosis. Based on these several limitations, we hope that for further similar research, data can be taken from electronic medical records and include patient demographic data and patient diagnosis data quickly and accurately to avoid bias in research results.

Conclusion

In conclusion, ischemic heart disease is the most common found in most patients with cardiovascular disease in West Nusa Tenggara General Hospital. The highest fatality rate is in atrial fibrillation or atrial flutter. It is essential to monitor the prevalence or case fatality rates of cardiovascular disease to focus on treatment and prevention strategies. The contribution of this descriptive research to the Althea Medical Journal is that it is hoped that the research data can be used as a reference for descriptive research on cardiovascular disease data in West Nusa Tenggara Province or other regions in the future and can also be used as a reference for cardiovascular disease data nationally.

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The authors declare no conflict of interest

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