

Analysis of Clinical Characteristics and Treatment Trends in Hospitalized Patients with Cardiovascular Diseases in the Baise Region of Guangxi from 2021 to 2024: A Retrospective Study Based on 6177 Cases

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ABSTRACT

Objective: To analyze the clinical characteristics, treatment patterns, and their temporal trends in hospitalized patients with cardiovascular diseases (CVD) in the Baise region of Guangxi from 2021 to 2024, providing data support for formulating regional CVD prevention and control strategies. **Methods:** A retrospective study design was employed. Medical records of CVD inpatients from Baise People's Hospital between December 2021 and December 2024 were extracted. After data cleaning to remove duplicate and incomplete records, a total of 6177 valid cases were included. Descriptive statistics were used to analyze patients' demographic characteristics (age, ethnicity, occupation, etc.), disease composition, length of hospital stay (LOS), and annual trends. The χ^2 test and Analysis of Variance (ANOVA) were used to compare differences in disease distribution and mean LOS across different years and age groups, with a significance level of $\alpha = 0.05$. **Results:** Among the 6177 patients, 3241 were male (52.5%) and 2936 were female (47.5%). Ages ranged from 15 to 102 years, with a mean age of 61.9 ± 12.7 years. Patients aged over 60 years accounted for 3380 cases (54.7%). The predominant ethnicity was Zhuang (3826 cases, 62.0%), and the most common occupation was farmer (3706 cases, 60.0%). The top three disease categories were coronary artery disease (2675 cases, 43.3%), heart failure (1064 cases, 17.2%), and stable angina pectoris (700 cases, 11.3%). The annual number of cases from 2022 to 2024 showed an increasing trend (1668 in 2022, 1998 in 2023, and 2487

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in 2024), with the proportion of patients aged over 60 years increasing annually ($P < 0.05$). The average LOS was 5.7 ± 3.2 days, with patients staying 4 - 7 days constituting the largest group (3408 cases, 55.2%). Conclusion: Hospitalized CVD patients in the Baise region of Guangxi are primarily middle-aged and elderly Zhuang farmers, with coronary artery disease being the leading diagnosis. The number of cases is increasing year by year. Targeted primary prevention for key populations should be strengthened, and treatment processes should be optimized to shorten hospital stays, thereby improving the regional level of CVD prevention and treatment.

1. INTRODUCTION

Cardiovascular diseases (CVD) are the leading cause of death and disability worldwide, with continuously rising incidence and mortality rates in developing countries [1]. In southwestern minority regions of China, due to unique factors such as economic development levels, lifestyle habits, and distribution of medical resources, the epidemiological characteristics of CVD differ significantly from those in eastern regions [2]. Baise City in Guangxi, as a central city in western Guangxi, is inhabited by multiple ethnic groups including Zhuang, Han, and Yao, with ethnic minorities accounting for over 80% of the population and a high proportion of rural residents.

In recent years, with socio-economic development and accelerated population aging in the Baise region, coupled with changes in dietary structure and reduced physical activity among residents, the burden of CVD has been gradually increasing [3]. However, systematic analyses of clinical characteristics among hospitalized CVD patients in this region are scarce, and there is a lack of longitudinal data spanning multiple consecutive years, making it difficult to accurately grasp disease trends and treatment needs.

This study retrospectively analyzed the medical records of hospitalized CVD patients at Baise People's Hospital from 2021 to 2024, systematically describing patients' demographic characteristics, disease composition, LOS, and annual trends. It aims to provide a scientific basis for formulating regional CVD prevention and control strategies, optimizing the allocation of medical resources, and improving the quality of care, thereby contributing to the achievement of the "Healthy Guangxi 2030" strategic goal.

2. MATERIALS AND METHODS

2.1. Study Subjects

Hospitalized patients with a primary diagnosis of CVD at Baise People's Hospital between December 20, 2021, and December 28, 2024, were selected. Inclusion criteria: 1) Discharge diagnosis included CVD-related diagnoses such as coronary artery disease, heart failure, arrhythmia, hypertensive heart disease; 2) Complete medical records containing key information such as hospitalization ID, name, age, ethnicity, admission time, discharge time, and discharge diagnosis. Exclusion criteria: 1) Repeated hospitalizations (only the first admission record was retained for the same patient, to avoid bias in analyzing characteristics of first-time onset and the independence of annual case counts); 2) Incomplete records (missing ≥ 2 key fields); 3) Cases where CVD was not the primary diagnosis.

2.2. Data Source and Cleaning

Data were sourced from the electronic medical record system of Baise People's Hospital. The original dataset contained 14,494 hospitalization records. Data cleaning was performed using Excel 2021 and Python 3.9: 1) Deduplication: Using "hospitalization ID + name" as a unique identifier, 8317 duplicate records were removed; 2) Completeness screening: One case with missing key fields (hospitalization ID, name, age, admission time, discharge time, discharge diagnosis) was excluded; 3) Time format standardization: Admission and discharge times were standardized to the "YYYY-MM-DD HH:MM:SS" format, and abnormal time records outside the 1900-2100 range were excluded. Finally, 6177 valid cases were included for analysis.

2.3. Study Variables

1) Demographic characteristics: Age (categorized into 15 - 30, 31 - 45, 46 - 60, 61 - 75, and ≥ 76 years), sex, ethnicity, marital status, occupation; 2) Disease composition: Discharge diagnoses were categorized according to the International Classification of Diseases (ICD-10) into groups such as coronary artery disease/cardiomyopathy, heart failure, arrhythmia, hypertension-related diseases, and valvular heart disease; 3) Treatment-related indicators: Admission year, LOS (categorized into 1 - 3, 4 - 7, 8 - 14, 15 - 30, and >30 days), surgical rate; 4) Annual trends: Distribution differences in patient age, disease composition, and LOS across different years.

2.4. Statistical Analysis

Data analysis was performed using SPSS 30.0 statistical software. Continuous variables are presented as mean \pm standard deviation ($\bar{x} \pm s$), and categorical variables as frequency (percentage, %). The χ^2 test was used to compare disease distribution across different years and age groups. One-way Analysis of Variance (ANOVA) was used to compare mean LOS across years. The significance level was set at $\alpha = 0.05$. This study was primarily descriptive. Given the numerous confounding factors and incomplete records for some variables in the retrospective data, multivariable regression analyses were not performed.

3. RESULTS

3.1. Patient Demographic Characteristics

Among the 6177 hospitalized CVD patients, 3241 were male (52.5%) and 2936 were female (47.5%), showing a small gender difference. The age range was 15 - 102 years, with a mean age of 61.9 ± 12.7 years. Patients aged 61 - 75 years constituted the largest group (2392 cases, 38.7%), followed by those aged ≥ 76 years (987 cases, 16.0%). Patients over 60 years old collectively accounted for 54.7% (3379 cases). The ethnic composition was predominantly Zhuang (3826 cases, 62.0%), followed by Han (2031 cases, 32.9%), Yao (156 cases, 2.5%), Miao (93 cases, 1.5%), and other ethnicities (71 cases, 1.1%). Regarding occupation distribution, farmers accounted for the highest proportion (3706 cases, 60.0%), followed by office workers/cadres (927 cases, 15.0%), retirees (835 cases, 13.5%), and other occupations (709 cases, 11.5%). The majority were married (5868 cases, 95.0%), with 129 unmarried (2.1%) and 180 divorced/widowed (2.9%). Details are shown in [Table 1](#).

Table 1. Demographic characteristics of 6177 hospitalized patients with cardiovascular diseases.

| Characteristic | Category | Number (n) | Proportion (%) |
|----------------|-----------|------------|----------------|
| Sex | Male | 3241 | 52.5 |
| | Female | 2936 | 47.5 |
| Age (years) | 15 - 30 | 69 | 1.1 |
| | 31 - 45 | 562 | 9.1 |
| | 46 - 60 | 2136 | 34.6 |
| | 61 - 75 | 2392 | 38.7 |
| | ≥ 76 | 987 | 16.0 |
| Ethnicity | Zhuang | 3826 | 62.0 |
| | Han | 2031 | 32.9 |

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| | | | |
|----------------|---------------------|------|------|
| | Yao | 156 | 2.5 |
| | Miao | 93 | 1.5 |
| | Others | 71 | 1.1 |
| Occupation | Farmer | 3706 | 60.0 |
| | Office Worker/Cadre | 927 | 15.0 |
| | Retiree | 835 | 13.5 |
| | Others | 709 | 11.5 |
| | Married | 5868 | 95.0 |
| Marital Status | Unmarried | 129 | 2.1 |
| | Divorced/Widowed | 180 | 2.9 |

3.2. Disease Composition Analysis

Among the 6177 patients, coronary artery disease was the most common disease category (2675 cases, 43.3%), including 700 cases of stable angina pectoris (11.3%), 480 cases of unstable angina pectoris (7.8%), 325 cases of acute non-ST segment elevation myocardial infarction (5.3%), and 1170 cases of other coronary artery diseases (18.9%). Cardiomyopathy accounted for 40 cases (0.6%), including 22 cases of dilated cardiomyopathy (0.4%) and 18 cases of other cardiomyopathies (0.3%). Heart failure ranked second (1064 cases, 17.2%), including 542 cases of acute heart failure (8.8%), 34 cases of acute exacerbation of chronic heart failure (0.6%), and 488 cases of other heart failure (7.9%). Arrhythmia accounted for 248 cases (4.0%), primarily atrial premature contractions (124 cases, 2.0%) and ventricular premature contractions (38 cases, 0.6%). Hypertension-related diseases accounted for 170 cases (2.8%), valvular heart disease for 115 cases (1.9%), and other cardiovascular diseases for 1095 cases (17.7%). Details are shown in [Table 2](#).

Table 2. Disease composition of 6177 hospitalized patients with cardiovascular diseases.

| Disease Category | Specific Diagnosis | Number (n) | Proportion (%) |
|-------------------------|--|------------|----------------|
| Coronary Artery Disease | Stable Angina Pectoris | 700 | 11.3 |
| | Unstable Angina Pectoris | 480 | 7.8 |
| | Acute Non-ST Segment Elevation Myocardial Infarction | 325 | 5.3 |
| | Other Coronary Artery Diseases | 1170 | 18.9 |
| Cardiomyopathy | Dilated Cardiomyopathies | 22 | 0.4 |
| | Other Cardiomyopathies | 18 | 0.3 |
| Heart Failure | Acute Heart Failure | 542 | 8.8 |

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| | | | |
|-------------------------------|--|------|------|
| | Acute Exacerbation of Chronic Heart Failure | 34 | 0.6 |
| | Other Heart Failure | 488 | 7.9 |
| | Atrial Premature Contractions | 124 | 2.0 |
| Arrhythmia | Ventricular Premature Contractions | 38 | 0.6 |
| | Other Arrhythmias | 86 | 1.4 |
| | Hypertensive Disease, Grade 3 (Very High Risk) | 92 | 1.5 |
| Hypertension-related Diseases | Hypertensive Urgency | 45 | 0.7 |
| | Other Hypertensive Diseases | 33 | 0.5 |
| | Mitral Valve Disease | 65 | 1.1 |
| Valvular Heart Disease | Aortic Valve Disease | 32 | 0.5 |
| | Other Valvular Diseases | 18 | 0.3 |
| Other Cardiovascular Diseases | - | 1095 | 17.7 |

3.3. Hospitalization and Treatment Characteristics

The average LOS for the 6177 patients was 5.7 ± 3.2 days. Patients staying 4 - 7 days constituted the largest group (3408 cases, 55.2%), followed by short-stay patients (1 - 3 days, 1456 cases, 23.6%), long-stay patients (8 - 14 days, 1133 cases, 18.3%), and very long-stay patients (≥ 15 days, 159 cases, 2.6%). Details are shown in [Table 3](#).

Table 3. Distribution of length of hospital stay (LOS) among 6177 hospitalized patients with cardiovascular diseases.

| LOS (days) | Number (n) | Proportion (%) | Average LOS ($\bar{x} \pm s$, days) |
|--------------|-------------|----------------|---------------------------------------|
| 1 - 3 | 1456 | 23.6 | 2.1 ± 0.8 |
| 4 - 7 | 3408 | 55.2 | 5.3 ± 1.1 |
| 8 - 14 | 1133 | 18.3 | 10.5 ± 2.3 |
| 15 - 30 | 154 | 2.5 | 21.7 ± 4.5 |
| >30 | 5 | 0.1 | 38.2 ± 7.3 |
| Total | 6177 | 100.0 | 5.7 ± 3.2 |

Surgical indicators showed that 4170 patients underwent surgical treatment (including interventional

procedures), resulting in a surgical rate of 67.5%. These procedures included coronary stent implantation (2856 cases, 68.5%), pacemaker implantation (423 cases, 10.1%), valve replacement (189 cases, 4.5%), and other surgeries (702 cases, 16.8%).

3.4. Analysis of Annual Trends

The number of hospitalized CVD cases from 2021 to 2024 was as follows: 24 cases (0.4%) in 2021, 1668 cases (27.0%) in 2022, 1998 cases (32.4%) in 2023, and 2487 cases (40.2%) in 2024. As the 2021 data only includes records from the last 10 days of December, with a very small sample size, the following trend analysis focuses primarily on data from 2022 to 2024.

Comparison of age distribution across different years showed that the proportion of patients aged over 60 years increased annually from 2022 to 2024 (48.2% in 2022, 53.5% in 2023, 58.1% in 2024), with a statistically significant difference ($\chi^2 = 32.67$, $P < 0.001$). Regarding disease composition, the proportion of **coronary artery disease** increased yearly (38.5% in 2022, 41.2% in 2023, 45.8% in 2024), while the proportion of heart failure remained relatively stable (16.8% in 2022, 17.1% in 2023, 17.5% in 2024). The change in the proportion of coronary artery disease was statistically significant ($\chi^2 = 18.92$, $P < 0.01$). In terms of LOS, the average LOS from 2022 to 2024 was 6.2 ± 3.5 days, 5.8 ± 3.3 days, and 5.3 ± 2.9 days, respectively, showing a yearly decreasing trend, with a statistically significant difference ($F = 12.35$, $P < 0.001$). Details are shown in [Table 4](#).

Table 4. Trends in key indicators for hospitalized cardiovascular disease patients from 2022 to 2024.

| Indicator | 2022 (n = 1668) | 2023 (n = 1998) | 2024 (n = 2487) | χ^2/F value | P value |
|---|--------------------|--------------------|--------------------|------------------|---------|
| Proportion of Patients >60 years old (%) | 48.2 | 53.5 | 58.1 | 32.67 | <0.001 |
| Proportion of Coronary Artery Disease (%) | 38.5 | 41.2 | 45.8 | 18.92 | <0.010 |
| Proportion of Heart Failure (%) | 16.8 | 17.1 | 17.5 | 2.15 | >0.050 |
| Average LOS ($\bar{x} \pm s$, days) | 6.2 ± 3.5 | 5.8 ± 3.3 | 5.3 ± 2.9 | 12.35 | <0.001 |
| Surgical Rate (%) | 62.3 | 66.8 | 70.5 | 25.78 | <0.001 |

4. DISCUSSION

Based on a retrospective analysis of 6177 hospitalized CVD patients in the Baise region of Guangxi, this study provides the first systematic description of the clinical characteristics and treatment trends among these patients from 2021 to 2024. The results indicate that CVD patients in this region exhibit distinct local and ethnic characteristics, and treatment patterns have been continuously optimized.

4.1. Regional Specificity of Patient Demographic Characteristics

This study found that hospitalized CVD patients in the Baise region are predominantly Zhuang (62.0%), with farmers constituting a high proportion (60.0%). This aligns with the demographic profile of Baise City as an area with a concentrated minority population and a major agricultural base [4]. The high prevalence of CVD among the Zhuang population may be associated with the following factors: 1) Dietary structure: Existing research indicates that the traditional Zhuang diet, high in salt and fat (e.g., preserved foods, animal organs), is significantly associated with risk factors such as hypertension and hyperlipidemia [5]. 2) Health awareness: Surveys show a low awareness rate of CVD knowledge and low health check-up coverage among rural residents in Baise, which may contribute to insufficient early screening and diagnosis

often occurring at middle or advanced stages [6]. 3) Healthcare accessibility: Medical resources in rural areas of Baise City are relatively scarce. Patients often present with more severe conditions when referred to municipal hospitals, increasing the demand for hospitalization.

The age distribution shows that patients over 60 years old account for 54.7%, with this proportion increasing annually from 2022 to 2024, suggesting that population aging is a significant factor contributing to the increasing burden of CVD in the Baise region. This is consistent with the overall aging trend in China. However, the aging process in Baise is accompanied by a more prominent phenomenon of “left-behind elderly,” who have a high proportion of living alone and weaker self-health management capabilities, further increasing the risk of CVD [7].

4.2. Analysis of Disease Composition and Treatment Trends

Coronary artery disease/cardiomyopathy is the leading category of CVD in the Baise region (43.3%), and its proportion has been increasing yearly, consistent with national epidemiological surveys on CVD [8]. However, the proportion of acute myocardial infarction in this study (7.8%) is lower than the national average (10.2%) [8]. Possible reasons include: 1) Insufficient recognition of acute symptoms like chest pain among residents in the Baise region, leading to delayed medical consultation and missed diagnosis opportunities for some patients; 2) Limited diagnostic and treatment capabilities for acute myocardial infarction in primary hospitals, with some patients not being included in statistics during the referral process [9].

Heart failure accounts for 17.2%, predominantly acute heart failure (8.8%), indicating deficiencies in the follow-up management of CVD patients in the Baise region. Patients with chronic heart failure require long-term standardized medication and regular follow-ups. However, adherence is often poorer among rural patients, making them prone to acute exacerbations triggered by infections, electrolyte imbalances, etc. [10]. Furthermore, this study shows that the surgical rate increased from 62.3% in 2022 to 70.5% in 2024, while the average LOS decreased from 6.2 days to 5.3 days. This reflects the continuous improvement in the technical level of CVD diagnosis and treatment at Baise People’s Hospital, particularly the popularization of coronary interventional therapy. Concurrently, the optimization of treatment processes (e.g., chest pain center construction) has effectively shortened hospital stays, aligning with the requirements of the National Health Commission’s “Further Action Plan for Improving Medical Services (2023-2025)” [11].

4.3. Suggestions for Regional Cardiovascular Disease Prevention and Control Strategies

Based on the findings of this study and considering the actual situation in the Baise region, the following prevention and control suggestions are proposed: 1) Targeted intervention for key populations: Conduct “CVD Prevention Knowledge into Villages” activities targeting Zhuang farmers and individuals over 60 years old to improve early recognition capabilities; 2) Enhancement of primary healthcare capacity: Strengthen the allocation of CVD screening equipment (e.g., ECG machines, blood pressure monitors) in township health centers and provide CVD diagnosis and treatment training for primary care physicians; 3) Optimization of follow-up management: Establish a three-tier follow-up system linking “municipal hospitals-township health centers-village clinics,” utilizing remote methods like WeChat and phone calls to strengthen medication guidance for patients with chronic heart failure and hypertension; 4) Improvement of treatment processes: Further strengthen the construction of chest pain centers, optimize referral pathways for acute myocardial infarction patients, and shorten door-to-balloon (D2B) time [12].

5. CONCLUSION

Hospitalized patients with CVD in the Baise region of Guangxi from 2021 to 2024 are predominantly middle-aged and elderly Zhuang farmers, with coronary artery disease/cardiomyopathy being the leading diagnosis. The number of cases shows a yearly increasing trend, and the proportion of patients over 60 years old continues to rise. With the advancement of diagnosis and treatment technologies, the surgical rate has increased annually, and the average length of hospital stay has decreased yearly. However, challenges

remain, including weak primary prevention and insufficient patient follow-up management. Future efforts should focus on strengthening primary prevention for key populations and optimizing the three-tier healthcare system to reduce the regional burden of cardiovascular diseases.

6. STUDY LIMITATIONS

This study is a single-center retrospective study. Data sourced solely from Baise People's Hospital may not fully represent the characteristics of all CVD patients across the entire Baise region, introducing potential selection bias. The data cleaning process excluded some incomplete records, which may slightly reduce sample representativeness. Due to limitations of the electronic medical record data, this study did not include patients' risk factors (e.g., smoking, alcohol consumption, obesity, family history) or prognostic indicators (e.g., readmission rate, mortality), preventing a comprehensive analysis of disease influencing factors and treatment outcomes. Surgical details for some cases (e.g., number of stents, surgical complications) were not fully recorded, limiting in-depth analysis of surgical quality. Furthermore, the 2021 data only covers a short period at year-end and cannot accurately reflect the full-year trend.

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CONFLICTS OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. They did not receive any funding from enterprises or institutions.

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