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Prevalence of Cardiovascular Diseases Diagnosed via 2D Echocardiography in a Selected Secondary Private Hospital in Cavite: A Retrospective Study

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ABSTRACT

Cardiovascular diseases remain major causes of morbidity and mortality, making timely diagnostic evaluation important in hospital-based cardiovascular care. This retrospective quantitative-descriptive and correlational study determined the prevalence of cardiovascular diseases diagnosed through two-dimensional (2D) echocardiography in a selected secondary private hospital in Cavite from January 2019 to December 2024. The study used total enumeration of 4,826 eligible patient records from the hospital medical records section. Data included age, height, sex, weight, ejection fraction, type of cardiovascular diagnosis, and patient classification as inpatient or outpatient. Frequency, percentage, prevalence rate, time-series trend analysis, and chi-square test of association were used. Findings showed that most patients with cardiovascular diseases were middle-aged adults, particularly those 40 to 69 years old, with a consistent male predominance and a higher proportion among patients weighing 51 to 70 kg. Most patients had preserved left ventricular systolic function, with ejection fraction ranging from 53% to 75%. Concentric left ventricular hypertrophy was the most frequent diagnosis, followed by eccentric left ventricular hypertrophy and heart failure, while congenital and rheumatic heart diseases were least common. Outpatient cases comprised a substantial proportion of examinations, although inpatient utilization increased in 2020 and 2024. Overall CVD prevalence increased from 62.41% in 2019 to 73.84% in 2024, with a temporary decline in 2021. Age, height, and weight were significantly associated with CVD prevalence, while sex was not. The study provides baseline local evidence for cardiovascular screening, hospital planning, preventive programs, and data-driven health management in Cavite.

Keywords: *cardiovascular diseases, 2D echocardiography, prevalence, retrospective study, ejection fraction, Cavite*

INTRODUCTION

Cardiovascular diseases (CVDs) remain among the most pressing health concerns worldwide because they affect the heart and blood vessels and are associated with risk factors such as hypertension, high cholesterol, smoking, obesity, sedentary lifestyle, and poor nutrition (National Cancer Institute, 2025; World Health Organization [WHO], 2021). The World Health Organization reported that CVDs accounted for a major proportion of global deaths, with many deaths occurring in low- and middle-income countries. In the Philippines, diseases of the heart have consistently ranked among the leading causes of mortality, making cardiovascular surveillance, early diagnosis, and effective management essential public health priorities (Philippine Statistics Authority [PSA], 2024; WHO, 2023).

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Cavite, as part of the highly urbanized and populous CALABARZON region, has experienced rapid demographic and lifestyle changes that contribute to the burden of noncommunicable diseases. The provincial health profile cited in the study indicated that ischemic heart disease was the leading cause of mortality in Cavite, followed by other forms of heart disease, while hypertensive and cerebrovascular diseases also ranked among the major causes of death. These conditions underscore the importance of accessible diagnostic services and targeted cardiovascular prevention programs at the hospital and community levels (Cavite Provincial Government, 2024; PSA, 2024).

Two-dimensional echocardiography is a safe, non-invasive, and clinically useful diagnostic modality for evaluating cardiac structure and function. It is widely used to assess left ventricular systolic function, valvular abnormalities, hypertrophic changes, cardiomyopathies, congenital conditions, pulmonary hypertension, and other cardiovascular abnormalities (Harkness et al., 2020; Johns Hopkins Medicine, 2024; Lang et al., 2015). Because it provides real-time information about cardiac anatomy and function, 2D echocardiography is particularly valuable in secondary hospitals where early detection, follow-up, and referral decisions are central to patient care.

Despite the clinical importance of echocardiography, local hospital-based data on the prevalence and distribution of CVDs diagnosed through 2D echocardiography remain limited, particularly in secondary private hospitals in Cavite. Most available cardiovascular data focus on national mortality, tertiary hospital experience, or risk assessment rather than actual echocardiographic diagnoses within a defined local facility. This gap limits the ability of hospital administrators, clinicians, and public health stakeholders to design evidence-based cardiovascular screening, diagnostic, and management programs tailored to local needs.

This study therefore determined the prevalence of cardiovascular diseases diagnosed via 2D echocardiography in a selected secondary private hospital in Cavite from January 2019 to December 2024. Specifically, it described the demographic profile of patients in terms of age, height, sex, and weight; identified the prevalence of CVDs according to ejection fraction, disease type, and patient classification; and tested the association between selected demographic variables and CVD prevalence. The study supports the goals of the Universal Health Care Act by using existing hospital data to strengthen disease surveillance, health planning, and early cardiovascular detection (Republic Act No. 11223, 2019).

Literature Review

Cardiovascular Disease Burden and Local Surveillance

Cardiovascular disease refers to a group of disorders affecting the heart and blood vessels and includes ischemic heart disease, heart failure, valvular disease, hypertensive heart disease, and other structural or functional conditions (National Cancer Institute, 2025). The global literature consistently identifies CVDs as leading causes of death and disability, with age, sex, metabolic profile, and lifestyle factors influencing disease burden (Rethemiotaki, 2023; Suman et al., 2023; WHO, 2021). These patterns support the need for continuous monitoring because CVDs are largely preventable and manageable when detected early.

In the Philippines, heart diseases remain a leading cause of death, while noncommunicable diseases contribute substantially to national mortality (Department of Health, 2022; PSA, 2024). Cavite data cited in the manuscript showed high mortality from ischemic heart disease, other forms of heart disease, hypertensive diseases, and cerebrovascular diseases (Cavite Provincial Government, 2024). These data establish the importance of generating local hospital-based evidence to complement national reports and support preventive programs, clinical planning, and resource allocation.

2D Echocardiography in Cardiovascular Diagnosis

Two-dimensional echocardiography is a standard diagnostic tool that visualizes the motion and structure of the heart through ultrasound. It helps evaluate atherosclerosis-related wall motion abnormalities, cardiomyopathy, congenital heart disease, heart failure, aneurysm, valvular disease, pericardial disease, and other cardiac

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abnormalities (Johns Hopkins Medicine, 2024). It is also widely used to assess ejection fraction, a key indicator of the heart's pumping ability and left ventricular systolic function.

Ejection fraction is commonly interpreted using established reference ranges. Normal or preserved left ventricular ejection fraction is generally associated with effective myocardial contractility, while reduced values may indicate impaired ventricular function or heart failure (Cleveland Clinic, 2022; Harkness et al., 2020; Lang et al., 2015). In clinical practice, echocardiographic findings provide evidence for diagnosis, classification, monitoring, and treatment planning, particularly in settings where advanced imaging such as cardiac MRI or CT may not be routinely available.

Demographic and Anthropometric Factors in Cardiovascular Risk

Demographic characteristics influence CVD patterns. Studies have shown that CVD prevalence varies by age and sex, with different cardiovascular conditions showing distinct distributions between males and females (Cesaroni et al., 2021; Rethemiotaki, 2023; Sun et al., 2023). Middle and older adulthood are especially important periods for CVD occurrence, although some cardiovascular conditions can begin earlier in life (Roth et al., 2020; Suman et al., 2023).

Height and weight are also relevant in cardiovascular assessment because they are used to estimate body mass index and body surface area, both of which influence cardiovascular risk and echocardiographic interpretation. Obesity and excess body weight increase cardiac workload and may contribute to hypertension, left ventricular hypertrophy, coronary artery disease, heart failure, and other structural changes detectable through echocardiography (Angeles-Agdeppa et al., 2020; DOST-FNRI, 2019; Rider et al., 2020; Russo et al., 2016). Therefore, anthropometric data are necessary for interpreting the prevalence and distribution of cardiovascular findings.

Hospital-Based Evidence and Research Gap

Hospital-based retrospective studies are useful for describing disease patterns, especially when they use existing medical records and diagnostic reports. Such designs allow researchers to examine prevalence, distribution, and trends across defined periods without manipulating variables (Bhandari, 2023; George, 2025). In echocardiography-based research, medical records provide practical evidence on actual diagnostic utilization and the types of cardiovascular abnormalities encountered in routine hospital practice.

Philippine studies have examined echocardiography utilization and cardiovascular risk patterns. Villanueva et al. (2020) documented the appropriateness of transthoracic echocardiography among adult patients in a tertiary hospital, while Paterno (2020) assessed cardiovascular risk among patients with hypertension and diabetes in Cavite. Magno et al. (2023) also emphasized the state of cardiovascular resources and echocardiography expertise nationwide. However, published studies focusing specifically on CVD prevalence diagnosed through 2D echocardiography in secondary private hospitals in Cavite remain limited, thereby justifying the present retrospective study.

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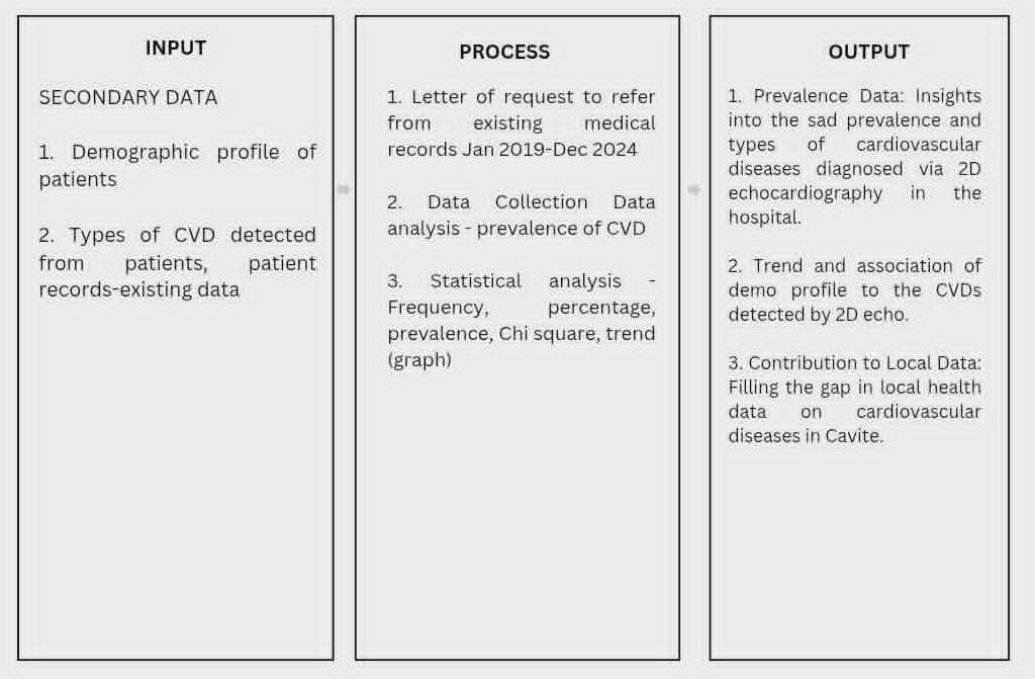
Figure 1. *Conceptual framework of the study*



The conceptual framework follows an input-process-output model. The inputs consisted of secondary hospital data, including demographic profile and CVD findings from existing patient records. The process involved retrieval, classification, tabulation, and statistical analysis of 2D echocardiography records from January 2019 to December 2024. The output consisted of prevalence data, trend information, and evidence on the association between demographic profile and CVDs diagnosed through 2D echocardiography.

METHODS

Research Design

This study employed a retrospective quantitative-descriptive, cross-sectional, and correlational design. It was retrospective because it analyzed existing hospital records and 2D echocardiography reports that had already been generated from January 2019 to December 2024. It was descriptive because it summarized the demographic profile, ejection fraction categories, CVD types, patient classifications, and prevalence rates. It was correlational because it tested the association between selected demographic variables and the prevalence of CVDs using chi-square analysis.

Research Locale

The study was conducted in a selected secondary private hospital in Cavite. The hospital provided 2D echocardiography services and maintained medical records used as secondary data for the study. The setting was appropriate because Cavite has a growing cardiovascular disease burden and represents a local context where hospital-based diagnostic data can support healthcare planning.

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Participants and Sampling Technique

The study did not involve direct human participants because it used existing patient medical records. The records included patients who underwent 2D echocardiography in the selected hospital from January 2019 to December 2024. Total enumeration sampling was applied, including all eligible records that met the inclusion criteria. The final dataset consisted of 4,826 patient records. Records were included when they contained complete echocardiographic reports, documented demographic variables, and clear 2D echocardiographic findings. Incomplete, duplicate, non-diagnostic, or inconclusive records were excluded.

Research Instrument

The study used a researcher-made data extraction sheet to collect relevant information from medical records and echocardiographic reports. The tool captured age, height, sex, weight, examination year, ejection fraction category, type of cardiovascular diagnosis, patient classification, and normal findings. Diagnoses included cardiomegaly, congenital heart disease, coronary artery disease, heart failure, concentric and eccentric left ventricular hypertrophy, rheumatic heart disease, and valvular heart disease.

Data Gathering Procedure

A formal request for access to secondary data was submitted to the appropriate hospital authority. After approval, records from January 2019 to December 2024 were retrieved from the hospital medical records section and relevant databases. Data were extracted using the structured data collection form and were tallied, tabulated, and checked for completeness. Only data relevant to the research objectives were included in the analysis.

Data Analysis

Frequency and percentage were used to describe demographic variables, ejection fraction categories, CVD types, and patient classification. Prevalence rate was computed by dividing the number of CVD cases detected by the total number of patients who underwent 2D echocardiography per year and multiplying the result by 100 (Dahlberg, 2016). Time-series trend analysis was used to describe changes in prevalence from 2019 to 2024. The chi-square test of association was used to determine whether demographic variables were significantly associated with CVD prevalence at the 0.05 level of significance (Keller, 2018).

Ethical Consideration

The study used secondary medical records and posed minimal risk to patients. Confidentiality was maintained by anonymizing patient identifiers and by using the data only for research purposes. The researcher complied with the Data Privacy Act of 2012 by protecting personal information, limiting access to authorized persons, and reporting results in aggregate form (National Privacy Commission, n.d.). Findings were interpreted carefully and honestly to avoid misleading conclusions.

RESULTS AND DISCUSSION

Demographic Profile of Patients

The demographic results showed that CVD cases diagnosed by 2D echocardiography were concentrated among middle-aged and older adults. Across the six-year period, the 40-69 age group consistently had the highest proportion of cases, ranging from 45.19% in 2019 to 65.95% in 2021 and 64.22% in 2024. This pattern supports the established observation that CVDs are more common during middle and older adulthood, although cardiovascular risk may begin earlier depending on specific disease type and risk exposure (Rethemiotaki, 2023; Suman et al., 2023).

Height and weight distributions also showed relevant patterns. Patients in the 135-160 cm height category had higher proportions in 2019 and 2020, whereas those in the 161-200 cm category predominated from 2021 to 2024. In terms of sex, males consistently comprised a higher proportion of CVD cases than females across the six-year period. For weight, the 51-70 kg category had the highest percentage of CVD cases in all years, followed

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generally by the 71-99 kg category. These findings suggest that anthropometric and demographic characteristics should be considered in cardiovascular screening and echocardiographic interpretation.

Table 1. *Summary of demographic patterns of patients with CVDs detected by 2D echocardiography, 2019-2024*

Variable	Dominant Pattern From 2019-2024	Key Finding
Age	40-69 years	Highest percentage in all years; 45.19% in 2019, 65.95% in 2021, and 64.22% in 2024
Height	135-160 cm in 2019-2020; 161-200 cm in 2021-2024	Distribution shifted toward the taller group in four consecutive years
Sex	Male	Male cases were consistently higher than female cases, ranging from 53.81% to 57.50%
Weight	51-70 kg	Highest percentage in all years, ranging from 43.33% to 65.06%

Ejection Fraction, CVD Types, and Patient Classification

The ejection fraction findings showed that most patients had preserved left ventricular systolic function. Across all years, the 53-75% ejection fraction category recorded the largest number of patients, with 728 cases in 2019 and 729 cases in 2024. Patients with moderately reduced ejection fraction (41-52%) formed the second largest group, while patients with severely reduced ejection fraction below 20% were rare. This finding indicates that many patients undergoing 2D echocardiography had normal or preserved pumping function, although a substantial number still presented with reduced function requiring clinical attention.

The distribution of specific cardiovascular diagnoses showed that concentric left ventricular hypertrophy was the most frequent abnormality, with 1,328 total cases from 2019 to 2024. It was followed by eccentric left ventricular hypertrophy with 1,057 cases, heart failure with 439 cases, coronary artery disease with 218 cases, valvular heart disease with 165 cases, cardiomegaly with 32 cases, rheumatic heart disease with 25 cases, and congenital heart disease with seven cases. The predominance of hypertrophic changes may reflect the continuing burden of hypertension-related cardiac remodeling, consistent with the role of echocardiography in detecting structural cardiac changes (Corpuz, 2024; Harkness et al., 2020).

Table 2. *Patients with ejection fraction diagnosed by 2D echocardiography, 2019-2024*

Year	<20%	21-40%	41-52%	53-75%	Total
2019	7	139	323	728	1,197
2020	0	55	172	449	676
2021	0	41	98	422	561
2022	0	45	137	403	585
2023	7	82	236	515	840
2024	0	97	141	729	967
Total	14	459	1,107	3,246	4,826

Table 3. *Summary of the frequency of CVD diagnoses by 2D echocardiography, 2019-2024*

CVD Diagnosis	2019	2020	2021	2022	2023	2024	Total
Concentric LVH	252	176	179	164	214	343	1,328
Eccentric LVH	311	162	79	127	192	186	1,057
Heart failure	115	69	48	24	75	108	439

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Coronary artery disease	39	28	23	41	35	52	218
Valvular heart disease	14	27	34	31	39	20	165
Cardiomegaly	12	5	3	2	8	2	32
Rheumatic heart disease	4	4	1	1	7	8	25
Congenital heart disease	0	7	0	4	1	2	7
Normal findings	450	198	194	191	269	253	1,565

Prevalence Trend and Association with Demographic Profile

Outpatient cases constituted a substantial proportion of patients who underwent 2D echocardiography. Outpatient utilization was higher than inpatient utilization in 2019, 2021, 2022, and 2023, while inpatient percentages were higher in 2020 and nearly equal to outpatient percentages in 2024. These fluctuations may reflect differences in healthcare access, disease severity, admission practices, and service utilization during and after the COVID-19 period.

The yearly prevalence trend showed that CVDs diagnosed through 2D echocardiography increased from 62.41% in 2019 to 73.84% in 2024. A temporary decrease was observed in 2021, but prevalence increased again from 2022 onward. The total six-year prevalence was 67.78%, based on 3,271 CVD cases among 4,826 patients who underwent 2D echocardiography. The increasing trend points to a growing hospital-based cardiovascular burden and supports the need for routine screening, preventive education, and strengthened diagnostic capacity.

Table 4. *Patient classification and yearly prevalence of CVDs diagnosed by 2D echocardiography, 2019-2024*

Year	Total 2D Echo Patients	CVD Cases	Prevalence (%)	Inpatient (%)	Outpatient (%)
2019	1,197	747	62.41	40.52	59.48
2020	676	478	70.71	54.59	45.41
2021	561	367	65.42	33.16	66.84
2022	585	394	67.35	41.54	58.46
2023	840	571	67.98	45.48	54.52
2024	967	714	73.84	50.26	49.74
Total	4,826	3,271	67.78	-	-

The chi-square test showed that age, height, and weight were significantly associated with the prevalence of CVDs diagnosed through 2D echocardiography. Age had a statistically significant association with CVD prevalence ($X2 = 159.02$, $df = 20$, $p < 0.001$), indicating that CVD distribution varied across age groups. Height ($X2 = 45.642$, $df = 5$, $p < 0.001$) and weight ($X2 = 234.73$, $df = 15$, $p < 0.001$) were also significantly associated with CVD prevalence. Thus, the null hypothesis was rejected for age, height, and weight.

Sex was not significantly associated with CVD prevalence ($X2 = 3.892$, $df = 5$, $p = 0.565$), despite descriptive data showing a higher proportion of male cases. This indicates that the occurrence of CVDs did not significantly differ between male and female patients in the chi-square analysis. The result suggests that other demographic or clinical factors may have stronger associations with CVD prevalence than sex alone, which is consistent with the broader literature showing that sex-related cardiovascular patterns can vary depending on disease type, age, and risk factors (Cesaroni et al., 2021; Rethemiotaki, 2023; Sun et al., 2023).

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Table 5. *Association of demographic profile with CVDs detected by 2D echocardiography, 2019-2024*

Variable	Chi-square Value	df	p-value	Remarks	Decision
Age	159.02	20	<0.001	Highly significant	Reject H0
Sex	3.892	5	0.565	Not significant	Fail to reject H0
Height	45.642	5	<0.001	Highly significant	Reject H0
Weight	234.73	15	<0.001	Highly significant	Reject H0

CONCLUSION

The study concludes that cardiovascular diseases diagnosed through 2D echocardiography were common among patients in the selected secondary private hospital in Cavite from 2019 to 2024. The highest proportions of CVD cases were observed among middle-aged and older adults, with consistent male predominance and a greater concentration among patients weighing 51 to 70 kg. Most patients had preserved left ventricular systolic function, although a notable number had reduced ejection fraction and clinically relevant cardiac abnormalities.

Concentric left ventricular hypertrophy was the most prevalent cardiovascular condition, followed by eccentric left ventricular hypertrophy and heart failure. Rheumatic and congenital heart diseases were least common. The prevalence trend increased overall across the six-year period, reaching its highest level in 2024, despite a temporary decline in 2021. The chi-square findings confirmed that age, height, and weight were significantly associated with CVD prevalence, while sex was not significantly associated.

Overall, the study highlights the value of 2D echocardiography as a non-invasive diagnostic tool for detecting and monitoring cardiovascular diseases in hospital settings. The findings provide local baseline evidence that can support cardiovascular screening, clinical decision-making, hospital resource planning, and preventive health programs in Cavite.

Recommendation

Physicians and healthcare professionals should continue using 2D echocardiography appropriately as part of comprehensive evaluation for patients with suspected cardiovascular diseases, especially those with hypertension, diabetes mellitus, obesity, advanced age, or symptoms suggesting cardiac dysfunction. Patient education should emphasize lifestyle modification, treatment adherence, regular follow-up, and early consultation.

Hospital administrators should strengthen cardiovascular screening and surveillance programs by ensuring that 2D echocardiography services remain accessible, properly maintained, and integrated into hospital-based preventive care. Sonographers should continue professional training to improve accuracy, standardization, and quality of echocardiographic reporting.

Public health authorities and local policymakers may use the findings as baseline evidence for cardiovascular prevention and control programs in Cavite. Community-based programs should promote blood pressure monitoring, cardiovascular risk assessment, smoking prevention, healthy diet, physical activity, and public awareness of early symptoms and risk factors.

Educational institutions in allied health and hospital administration may integrate local epidemiological data into instruction and training to strengthen students' understanding of disease patterns and diagnostic services. Future researchers should expand the study to multiple hospitals, include clinical risk factors and laboratory data, convert height and weight into body mass index, and conduct prospective studies to determine predictors and outcomes of diagnosed cardiovascular diseases.

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