



Pattern of Findings in Echocardiography of Cardiovascular Diseases in Geriatric Patients: A Case Study of a Nigerian Tertiary Hospital

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Abstract

Background: Echocardiography is a non-invasive technique that provides information about cardiac structure, function, and hemodynamics. Therefore, the knowledge of the echocardiographic pattern is imperative for the effective planning and management of patients with cardiovascular diseases. Unfortunately, there is a lack of data on the pattern of echocardiographic findings among these patients in our locality. Consequently, there is a need for a study aimed at describing the pattern of findings in echocardiography of cardiovascular diseases in geriatric patients.

Methods: This retrospective study was conducted at the Federal Medical Centre, Asaba from January 2018 to March 2021. It involved 130 reports of cardiovascular disease patients selected using a random sampling technique. Only geriatric patients' echocardiography reports were included in the study and reports with incomplete information were excluded. Data collected were the patient's age, sex, indications and echocardiography findings.

Results: Out of 130 reports collected, 70 (53.8%) were female while 60(46.2%) were male. The age range of 71-75 years was the most occurring (27.8%) while 96-100 years were the least (0.6%). Also, hypertensive heart disease was the most common indication (34.6%) for echocardiography examination and the most frequent echocardiographic finding (56.8%). Mitral stenosis was the least occurring finding (0.6%). Echocardiographic findings showed a negative correlation with gender but a positive correlation with age, although all are statistically insignificant ($p > 0.05$).

Conclusions: Hypertensive heart disease represents the most prevalent indication for echocardiography and the most common echocardiographic finding.

Keywords

Geriatric Patients, Echocardiography, Hypertensive Heart Disease, Cardiovascular Disease

Abbreviations

CVD: Cardiovascular Disease; HHD: Hypertensive Heart Disease; CCF: Congestive Cardiac Failure; DCM: Dilated Cardiomyopathy; IHD: Ischemic Heart Disease; COPD: Chronic Obstructive Pulmonary Disease; CXR: Chest X-ray; LVH: Left Ventricular Hypertrophy; AGN: Acute Glomerulonephritis

Introduction

The cardiovascular system permits blood circulation and transports nutrients to and from the cells in the body. It also assists in stabilizing temperature, pH (potential of hydrogen), and maintaining homeostasis. The essential components of the cardiovascular system are the heart and blood vessels. However, dysfunction in these components may lead to a wide array of problems within the cardiovascular system. These include endocarditis, rheumatoid heart disease, hypertensive heart disease, left ventricular hypertrophy, stroke, cardiomyopathy, et cetera. These conditions are referred to as cardiovascular diseases, a general term used for a group of disorders of the heart and blood vessels.

Cardiovascular diseases are the number one cause of death globally; more people die annually from these ailments than from any other cause [1]. It has been recorded by the World Health Organization that over three-quarters of cardiovascular deaths take place in low- and middle-income countries. Out of the 17 million premature deaths (under the age of 70) due to non-communicable diseases in 2015, 82% were in low- and middle-income countries, and 37% were caused by cardiovascular diseases [1].

From a global perspective, Africa is a major contributor to the global burden of cardiovascular diseases and is disproportionately affected by cardiovascular diseases [2]. In 2013, an estimated one million deaths were attributable to cardiovascular diseases in Sub-Saharan Africa alone, constituting 5.5% of all global cardiovascular-related deaths and 11.3% of mortality in Africa [2]. Moreover, an almost two-fold increase in the total number of cardiovascular-related deaths over decades has been reported, with a greater than 10% difference in mortality among women compared with men [3]. Cardiovascular diseases are a significant public health concern and are responsible for 11% of over 2 million non-communicable deaths in Nigeria yearly [4].

A major cause of cardiovascular diseases is the build-up of fatty deposits on the inner walls of the blood vessels that supply the brain. Also, the presence of a combination of risk factors such as age, sex, and lifestyle

adds to the major cause. Considering age as the basic factor of this research, people aged 65 and older are much more likely to suffer a heart attack, stroke, or develop coronary artery disease than younger individuals [5].

Cardiovascular diseases can be examined through physical, clinical, and diagnostic means. Physical examination entails checking vital signs such as blood pressure, heart rate and rhythm, respiratory rate, and temperature. When an abnormality is found in one or all of these parameters, the patient may undergo a cardiac rehabilitation program. This program involves exercise training (walking, jogging), emotional support (counseling when emotionally depressed), and education about lifestyle changes to reduce the risks of developing cardiovascular diseases. These lifestyle changes include quitting smoking, eating a healthy diet, and maintaining a healthy weight.

Clinical examination involves the administration of medications that can reduce low-density lipoprotein cholesterol, improve blood flow, or regulate heart rhythm.

Cardiovascular diseases can also be diagnosed in the field of Medical Imaging. The ultimate aim of cardiovascular imaging is to maximize diagnostic accuracy and improve patient care and clinical outcomes cost-effectively. Modalities being used include Conventional Chest X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Imaging, and Echocardiography [16].

Chest X-ray (CXR) examination is often requested as the first imaging procedure for a patient with suspected cases of heart or lung disease [6]. Chest X-ray makes use of X-radiation to obtain diagnostic information about the chest region, such as the ribs, lungs, heart, and blood vessels [7]. It serves mostly as the primary source of information about a particular disease. Chest X-ray provides structural information, including the size and shape of the heart as well as the lungs and bones of the chest. However, it cannot determine the internal structure due to the loss of depth information [8].

Computed Tomography (CT) uses ionizing radiation to obtain images in the form of slices. This modality is used in diagnosing cardiovascular diseases, though some risks are associated with it. Most of the contrast material, sometimes known as dye, used for the examination contains iodine, which affects the kidney and causes allergic or adverse reactions such as itching, skin rash, difficulty in breathing, and cardiac arrest [9].

Magnetic Resonance Imaging (MRI) involves the use of radiofrequency waves and a powerful magnet to produce images of the body, although its high cost makes it scarce and not readily available in most hospitals and diagnostic centers.

Nuclear Imaging uses gamma rays emitted from radioactive material, injected into the blood and taken up by myocardial cells. However, it is expensive, and short half-life radiotracers restrict its hours of operation and on-demand use [10].

Although all these modalities are helpful in one way or the other, their drawbacks and unavailability make patients opt for another alternative modality known as Echocardiography. Echocardiography, also known as Cardiac Ultrasound, was first published by Hertz and Edler to assess cardiac diseases in the early 1950s, and the procedure came into use in Nigeria in the mid-1970s [11]. The advent of Echocardiography has significantly revolutionized the evaluation and management of patients with cardiovascular diseases [12]. It is a rapid and non-invasive method of examining the cardiovascular system, particularly the heart. Specifically, it uses high-frequency sound waves to assess the structural, functional, and hemodynamic state of the cardiovascular system. This allows for the diagnosis and management of cardiovascular diseases, representing approximately half of the diagnostic tests performed in Cardiac Imaging [13,14,15].

There are several modes of this modality, including transthoracic, trans-esophageal, intrathoracic, stress, et cetera. Of these, Transthoracic Echocardiography is the most commonly used [12]. This mode entails placing a transducer on the outside of the chest, close to the heart. The transducer sends sound waves through the chest and into the heart. The majority of echocardiograms are

performed by cardiac physiologists, and over 88% are reported by them [16,17].

Echocardiography is preferred to other modalities because of its availability, low cost, and high diagnostic accuracy in cardiac diseases [10]. Due to the prevalence of cardiovascular diseases in geriatric patients, this research is geared towards describing the pattern of findings using Echocardiography. It is non-invasive and non-ionizing, in addition to other features listed above. Hence, it will provide a detailed analysis of the diseases and related findings, including gender and age distribution.

Materials and Methods

Source of Data:

The data for this project was purely secondary data and obtained from the results (Cardiologist's reports) of the Echocardiography examinations performed, documented, and stored in the Radiology department of the Federal Medical Centre, Asaba.

Method of Data Collection:

The research team carried out its project through the collection of secondary data from geriatric patients with cardiovascular diseases who underwent Echocardiography examinations between January 2018 and March 2021. The research team obtained information such as patient age, sex, provisional diagnosis (clinical indications), and final echocardiography diagnosis from the Cardiologist reports. To collect data, the research team visited the center for one week. The data was made available by the practitioner. The handwritten cardiologist reports, which contained complete data, were well arranged accordingly from January 2018 to March 2021. The research team was asked to go through them and report after use at the end of the day. In cases where any information was missing, the research team excluded those cases, as the required information was incomplete.

Subject Selection:

Inclusion Criteria:

All echocardiographic records of geriatric patients performed at the Radiology department of the Federal Medical Centre, Asaba within the scope of the study.

Exclusion Criteria:

Reports not bearing one of the patient's identifiers such as age, sex, name, date of examination, or clinical information (such as indication and diagnosis) were excluded.

Results

The data was analyzed using the Microsoft Statistical Package for Social Sciences (SPSS) version 23.0, and the Pearson coefficients among the study parameters were determined. The demographics were analyzed using descriptive statistics.

Table-1 shows that 71-75 years of age are most occurring while 96- 100 years of age are the least occurring. The number of female patients is higher than the number of male patients.

Table-1: Distribution of Gender and Age Range

Gender	Frequency	Percent (%)
Male	60	46.2
Female	70	53.8
Total	130	100
Age Range		
65-70	44	27.2
71-75	45	27.8
76-80	20	12.3
81-85	15	9.3
86-90	5	3.1
96-100	1	0.6
Total	130	100

Table-2 illustrates Hypertensive heart disease as the most frequent indication for echocardiography.

Table-2: Common Indications for Echocardiography

Indications	Frequency	Percent (%)
HHDX	56	34.6
CCF	26	16
Cough, COPD	10	6.2
For surgery	4	2.5
DCM	4	2.5
Pulmonary embolism	2	1.2
Palpitations	2	1.2
IHD	2	1.2
Chest pain	2	1.2
Abnormal ECG finding	2	1.2
Osteosynostosis & osteoarthritis	1	0.6

Lung abscess HF	1	0.6
Dysuria, bladder stone, hydrocele	1	0.6
Endometrial ca	1	0.6
Postural dizziness	1	0.6
Post-coronary artery bypass	1	0.6
Pericardial effusion	1	0.6
Cerebellar stroke	1	0.6
LVH	1	0.6
Gastric ca	1	0.6
Neck swelling	1	0.6
Dyspnea on exertion	1	0.6
AGN	1	0.6
Weber's syndrome	1	0.6
CAP. R/O Cor pulmonale	1	0.6
Bleeding in the elderly	1	0.6
Herniorrhaphy	1	0.6
Cardiomegaly on CXR	1	0.6
Dyspnea on exertion	1	0.6
# OF left femoral neck	1	0.6
Total	130	100

Table-3 clearly illustrates Hypertensive heart disease as the most frequent echocardiographic finding and Mitral stenosis as the least frequent echocardiographic finding.

Table-3: Pattern of Echocardiographic Findings Among Geriatric Patients

Pattern of Findings	Frequency	Percentage
HHDX	92	56.8
DCM	18	11.1
COR PULMONALE	7	4.3
SYSTOLIC DYSFUNCTION	7	4.3
VHD	6	3.7
CALCIFICATION	6	3.7
AORTIC STENOSIS	5	3.1
PULMONARY HYPERTENSION	4	2.5
REGURGITATION	4	2.5
IHD	4	2.5
DIASTOLIC DYSFUNCTION	3	1.9
PERICARDITIS	3	1.9
NORMAL ECHO	2	1.2
MITRAL STENOSIS	1	0.6
Total	162	100

Table 4: Correlation of Echocardiographic Pattern with Gender and Age

		Gender	Echocardiographic Patterns	Age
Gender	Pearson Correlation	1	-0.102	-.182*
	Sig. (2-tailed)		0.248	0.038
	N	130	130	130
Echocardiographic patterns	Pearson Correlation	-0.102	1	0.018
	Sig. (2-tailed)	0.248		0.841
	N	130	162	130
Age	Pearson Correlation	-.182*	0.018	1
	Sig. (2-tailed)	0.038	0.841	
	N	130	130	130

* : Correlation is significant at the 0.05 level (2-tailed).

Table-4 illustrates the correlation of echocardiographic patterns with gender. There is no statistically significant relationship between echocardiographic patterns and gender.

Discussion

The potential of echocardiography as a research tool in Nigeria cannot be overemphasized. Studies in Nigeria have focused on common cardiovascular diseases such as hypertensive heart disease and others. The result of this study shows that the majority of the patients are female, 70 (53.8%), while 60 (46.2%) are male, as contained in **Table-1**. The majority of the patient age groups were 71–75 years (27.8%), followed by 65–70 years (27.2%), 76–80 years (12.5%), 81–85 years (9.3%), 86–90 years (3.1%), and 96–100 years (0.6%).

To Determine the Most Common Indication for Echocardiography Examination:

The result showed that the most common indication for geriatric echocardiography was hypertensive heart disease (HHDx), which constituted 56 (34.6%) of the clinical indications as illustrated in **Table-2**. This may be explained by the fact that hypertension increases as one ages, and this increase in the prevalence of hypertension in our society has led to a higher number of referred hypertensive patients for echocardiography. In Nigeria, the pooled prevalence of hypertension increased from 15% in 1990–1999 to 22.5% in 2000–2009 [11]. Similarly, the prevalence of uncontrolled hypertension is also high [11], with the attendant consequence of the development of complications of HHDx, including congestive cardiac failure. This is similar to other studies conducted by Mukadas et al.

[18], Saidu et al. [19], and Omoaghe et al. [20], who conducted their research in different locations but found hypertension to be the most common indication.

Also, from **Table-1**, females are more in number than males. Hypertension has been found to be more common in women over 60 years. Since there is no variation in race, this is in line with findings conducted in the United States in 2019 that obesity peaks in women at the age of 60 years, and at 70 and above, nearly 40% of women suffer from obesity-related hypertension. Therefore, this corresponds to the findings that obesity-related hypertension is more common in women than in men due to reduced exercise and decreased hormones at that age.

To Describe the Pattern of Echocardiographic Findings Among Geriatric Patients:

The result of our study showed that the pattern of echocardiographic findings among geriatrics that we assessed was majorly hypertensive heart disease, which made up 56.8% of the findings. This is similar to a study by Saidu et al., [19], who carried out the same research in a different location and found hypertensive heart disease to be the major echocardiographic finding [21–25]. This differs from a study by Ejim et al. [26], who stated that degenerative valvular disease was majorly seen in the elderly population and frequently resulted in cardiac chamber dilatation and consequent systolic and diastolic dysfunction of the ventricles [19]. This may reflect the fact that there is an active cardiac surgical unit in that center, thereby attracting referrals of patients with structural heart disease.

Also, the lifestyle of people may contribute to a change in echocardiographic findings, such as chronic alcohol consumption. However, it is possible that the lifestyle of two or more regions of the world may have the same pattern of findings after undergoing an echocardiography examination.

To Correlate Echocardiographic Patterns with Gender and Age:

The most common echocardiographic patterns were hypertensive heart disease and DCM; hence these were used to ascertain if there is a gender difference in echocardiographic patterns. The statistical test employed to test this relationship was the Pearson correlation. According to **Table-4**, the correlation between echocardiographic pattern and gender shows a p-value of 0.248, while the correlation coefficient (r) is -0.102. Since the p-value is greater than 0.05 (significant level), we conclude that there is no statistically significant relationship between echocardiographic pattern and gender.

Also, the correlation between echocardiographic pattern and age shows a p-value of 0.841, while the correlation coefficient (r) is 0.018. Since the p-value is greater than 0.05 (significant level), we conclude that there is no statistically significant relationship between echocardiographic pattern and age. This indicates that the echocardiographic pattern is independent of the gender and age of the patient.

Conclusion

The number of echocardiographic examinations referred to in this locality was more for females than males. The echocardiographic findings in geriatric echocardiography were majorly hypertensive heart disease (HHDx), followed by congestive cardiac failure among others. In addition, hypertensive heart disease was the most common indication for geriatric patients undergoing echocardiography examinations. Also, the echocardiographic pattern was not determined by the gender or age of the patient.

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Conflict of Interests

The authors declare no competing interest.

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Ethical Approval

Ethical clearance was obtained from the Radiology Department of the Federal Medical Centre, Asaba.

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