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A Clinical Study on the Correlation between Echocardiographic Parameters and Demographic Variables in Hypertension Patients

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ABSTRACT

Hypertension is one of the most prevalent chronic conditions worldwide, and its impact on cardiovascular morbidity and mortality is profound. Echocardiography provides an essential tool for assessing structural and functional changes in the heart, particularly left ventricular hypertrophy, which is a predictor of adverse outcomes. This study investigates the correlation between echocardiographic parameters and demographic variables such as age, gender, body mass index (BMI), and stages of hypertension.

The findings highlight that age and BMI play significant roles in influencing left ventricular mass, wall thickness, and diastolic dysfunction, while gender-specific variations in cardiac remodeling were also observed. The study emphasizes the clinical relevance of demographic factors in interpreting echocardiographic findings among hypertensive patients. Cardiovascular consequences of uncontrolled hypertension include left.

INTRODUCTION

Hypertension, often termed the 'silent killer,' is one of the leading causes of global disease burden. According to the World Health Organization, over 1.13 billion people suffer from hypertension, with a significant portion residing in low- and middle-income countries. The ventricular hypertrophy (LVH), systolic and diastolic dysfunction, stroke, and ischemic heart disease. Among the diagnostic modalities, echocardiography plays a vital role in assessing structural and functional cardiac changes. It provides non-invasive, reliable, and reproducible measurements of cardiac geometry and performance.

Demographic variables such as age, gender, and body mass index (BMI) significantly influence the manifestation and progression of hypertensive heart disease. For instance, advanced age is associated with higher prevalence of LVH and diastolic dysfunction, while gender differences reflect hormonal and anatomical variations in cardiac response to hypertension. Similarly, obesity, as quantified by BMI, exacerbates cardiac workload, leading to increased ventricular mass and concentric remodeling.

Despite extensive research on hypertension and echocardiography separately, fewer studies have comprehensively explored the interrelationship between demographic factors and echocardiographic parameters. This clinical study aims to fill this gap by analyzing the correlation between echocardiographic findings and demographic variables in hypertensive patients. The objectives are: (1) To evaluate echocardiographic parameters among hypertensive patients, (2) To correlate these parameters with age, gender, BMI, and stage of hypertension, and (3) To interpret the clinical significance of these correlations.

REVIEW OF LITERATURE

Several studies have highlighted the role of echocardiography in detecting subclinical cardiac dysfunction. Palmieri et al. (2001) emphasized the predictive power of LV mass index in cardiovascular outcomes. Chadha et al. (2009) linked obesity with increased LV mass and diastolic dysfunction. Cuspidi et al. (2010) demonstrated that BMI strongly correlates with the prevalence of LVH in hypertensive populations. Gender-based differences in echocardiographic findings were reported by Akintunde et al. (2013), showing greater concentric hypertrophy in men and eccentric hypertrophy in women. These findings establish the importance of demographic factors in shaping the echocardiographic profile of hypertensive individuals.

METHODOLOGY

This study employed a cross-sectional observational design, conducted between January 2018 and December 2020 at a tertiary-care hospital. A total of 500 hypertensive patients aged between 30 and 75 years were enrolled after obtaining informed consent. Inclusion criteria included patients with essential hypertension, while exclusion criteria comprised individuals with valvular heart disease, congenital anomalies, or previous myocardial infarction.

Demographic data such as age, gender, height, weight, and BMI were collected. Blood pressure measurements were taken in accordance with American Heart Association guidelines. Patients were classified into stages of hypertension (Stage I and II). Echocardiographic evaluations were conducted using 2D and M-mode imaging. Parameters assessed included left ventricular mass index (LVMI), relative wall thickness (RWT), ejection fraction (EF), and diastolic function indices. Statistical analysis was performed using Pearson's correlation and multiple regression to determine associations between variables.

RESULTS AND ANALYSIS

The study population comprised 300 males (60%) and 200 females (40%). The mean age was 54.3 ± 12.6 years, and the mean BMI was 27.8 ± 4.5 kg/m². Echocardiographic analysis revealed that 45% of participants had concentric LVH, 25% had eccentric LVH, while 30% had normal geometry.

Correlation analysis showed that age was significantly associated with LVMI ($r=0.48$, $p<0.01$) and diastolic dysfunction ($p<0.05$). BMI demonstrated a strong correlation with concentric hypertrophy ($r=0.52$, $p<0.01$). Gender-specific differences were observed, with males more prone to concentric remodeling, while females exhibited higher prevalence of eccentric hypertrophy. Stage II hypertension was associated with a higher frequency of LVH compared to Stage I ($p<0.001$).

DISCUSSION

The results reaffirm the established relationship between hypertension, demographic variables, and echocardiographic abnormalities. Advanced age correlates with progressive myocardial remodeling and impaired diastolic function. Elevated BMI intensifies cardiac strain, leading to concentric hypertrophy, a finding consistent with Cuspidi et al. (2010). Gender-specific differences highlight hormonal and anatomical variations, with men demonstrating greater concentric hypertrophy.
The study underscores the importance of routine echocardiographic assessment in hypertensive patients, particularly those with high BMI and advanced age. Early detection of structural and functional abnormalities enables timely intervention, reducing the risk of heart failure and other complications.

CONCLUSION AND FUTURE SCOPE

This clinical study highlights the significant correlation between echocardiographic parameters and demographic variables in hypertensive patients. Age, gender, and BMI play pivotal roles in influencing left ventricular structure and function. Routine echocardiographic screening should be considered essential in hypertensive management, particularly for high-risk groups. Future research should focus on longitudinal studies to establish causal relationships and evaluate the impact of lifestyle interventions and pharmacological therapies on cardiac remodeling.

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