Transthoracic Echocardiographic LV Remodeling in Young Adults: A Cross-Sectional Study

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Abstract

Introduction. Left ventricular remodeling is an adaptive response to aging and cumulative exposure to risk factors for cardiovascular disease. With the rising prevalence of cardiovascular disease in the younger population, a timely risk identification is warranted.

Objectives. This study aims to determine the prevalence of LV remodeling in young patients using transthoracic echocardiography, and to determine the association of their clinical profiles with LV remodeling.

Methodology. A retrospective cross-sectional design was utilized. Descriptive statistics using frequency and percentages was employed to describe the clinical profiles of patients; chi-square tests to assess the significance of associations of patients' clinical profile with the LV remodeling patterns; and One-way Analysis of Variance (ANOVA) followed by post-hoc tests for significant F values to provide insights into the differences of means across various cardiac parameters.

Results. Our study included 208 patients who had thoracic echocardiography from January 2021 to December 2022 at our institution. Majority were aged 31-40 years (64.4%), female (54.8%), and under the BMI classification of obese (52.9%). There were varying percentages per comorbidity, with hypertension (HPN) being the most prevalent. The presence of symptoms was also examined; however, it was not statistically significant. Age, sex, comorbidities, and presence of symptoms were not significantly associated with LV remodeling while BMI classification demonstrated a significant association ($\chi 2 = 25.457$, $p = 0.003$**). In this study, LV remodeling is already prevalent at 32.21% in young adults aged 18-40 years old. BMI classification demonstrated a significant association with LV remodeling pattern. Obesity showed a significant association with concentric remodeling pattern.

Conclusion. We found that LV remodeling is already prevalent in young adults aged 18-40 years old. BMI classification demonstrated a significant association with LV remodeling pattern. Obesity showed a significant association with concentric remodeling pattern.

Keywords: *LV remodeling, young cardiac patients, transthoracic echocardiography*

Introduction

Cardiac remodeling is recognized as an important aspect of cardiovascular disease (CVD) progression. Left ventricular remodeling progresses asymptomatically and precedes not only LVH, but also most other cardiac dysfunctions.

Young adult patients represent 10–23% of all men and women with a coronary illness.[1-3] In cardiac settings, adults are classified as young when they are between 18 and 40 years old.[4] With the rising prevalence of cardiovascular disease in this population, and studies showing worrying increase in hospitalization and mortality rates due to cardiovascular diseases, a timely risk identification is warranted.[3, 5]

While age is one of the most powerful risk factors for cardiovascular disease, the mechanisms by which aging predisposes to cardiovascular morbidity and mortality remain incompletely understood. It is well known that age is associated with left ventricular hypertrophy (LVH), but less clear is the degree to which this remodeling is accompanied by age-specific relative changes in LV mass, chamber performance, and intrinsic myocardial function in humans. Recent work has described aging-related cellular and molecular processes that likely contribute to myocardial dysfunction. Although the relation of advancing age with diastolic dysfunction is widely recognized, associated changes in systolic

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function are less clear. Conventional diagnostic methods may be limited in their ability to detect intrinsic age-associated changes in human myocardial function in relation to structural chamber remodeling. Furthermore, their link to cardiovascular morbidity and mortality remains elusive.[6]

Analysis of data to examine normative evolution of LV structure and function and related race-sex differences from young adulthood, from a population-based, longitudinal cohort study with a 25-year follow-up from baseline, found that a 20-year change in LV indexed mass and relative wall thickness (RWT) were associated with baseline LV indexed mass and RWT independent of baseline and 20- year change in clinical risk factors. A higher indexed LV end-systolic diameter (ESD) and mass at baseline were each significantly associated with 40–50% greater hazards for clinical stage C/D heart failure development during > 25 years of follow-up, independent of baseline demographics and risk factors.[7]

The major determinants of LV structural alterations include increased blood pressure, ethnicity, gender, obesity, diabetes mellitus as well as neurohumoral and genetic factors.[8]

The classical view of Hypertensive Cardiovascular Disease maintains that in conditions of pressure overload because of systemic hypertension and no other cardiac conditions, the LV undergoes extensive growth, leading to left ventricular hypertrophy (LVH), in an attempt to maintain cardiac output, despite the increased afterload imposed by systemic hypertension.[9]

However, many patients with high blood pressures do not present clinically detectable LVH. Therefore, a new view is emerging, sustaining that long-term exposure to the hemodynamic stress imposed by hypertension, in combination with the influence of other factors, including comorbidities (e.g., obesity, diabetes mellitus, and chronic kidney disease), sex, age, environmental exposures, and genetic factors, eventually leads to LV dysfunction and HF, as well as disturbances of the cardiac rhythm and the myocardial perfusion.[10, 11]

There are three recognized patterns of LV remodeling. These patterns of adverse LV remodeling can be defined based on measurement of left ventricular mass index (LVMI) and RWT: concentric remodeling (normal LVMI and increased RWT), eccentric hypertrophy (increased LVMI and normal RWT), and concentric hypertrophy (both LVMI and RWT are increased).[12]

Transthoracic echocardiography has received a strong indication for the initial evaluation of suspected hypertensive heart disease. However, there are very few echocardiographic studies done in young patients without established cardiovascular diseases. Abnormal left ventricular geometry is the early marker of LV remodeling that precedes hypertrophy and is frequently associated with LV diastolic dysfunction.[13] The early detection of abnormal Left ventricular geometry (LVG) can result in timely identification of subclinical hypertension-mediated organ damage and may help clinical decision and follow-up.[14]

Main Objective. This study aims to identify the age and clinical profile of the population that will benefit from an earlier detailed echocardiographic evaluation.

Specific Objectives:

1. To determine the prevalence of transthoracic echocardiographic LV remodeling in young patients aged 18-40 years old seen in NDCH from January 2021 to December 2022 as to:
   a. Concentric Remodeling
   b. Concentric Hypertrophy
   c. Eccentric Hypertrophy
2. To determine the association of the clinical profile with LV remodeling seen in transthoracic echocardiography using the LVMI and RWT as to:
   a. Concentric Remodeling
   b. Concentric Hypertrophy
   c. Eccentric Hypertrophy

Methodology

Study Design, Setting and Participants. This study used a retrospective cross-sectional study design to examine data from young patients aged 18-40, who had transthoracic echocardiography from January 2021 to December 2022 at NDCH. A prospective study design would have derived a better understanding of the association of the clinical profile with LV remodeling since the data gathered would have been complete. Generalizability of the study is difficult to establish because adequate representation of the community cannot be attained due to the fact that the majority of subjects included in the study either have an existing medical condition or risk factors prompting the need for the echocardiographic study. However, this study used already existing data to initiate subsequent prospective studies.

Young cardiac patients were subdivided into two groups, aged 18-30 and 31-40. The association of the clinical profile with LV remodeling seen in transthoracic echocardiography using the LVMI and RWT values to define the three patterns of adverse LV remodeling: concentric remodeling, concentric hypertrophy, and eccentric hypertrophy were then determined.

Inclusion Criteria

1. Age 18-40 years
2. With transthoracic echocardiography from January 2021 to December 2022 at NDCH.

Exclusion Criteria

1. Patients with prior echocardiographic evidence of left ventricular enlargement and hypertrophy
2. Patients who underwent cardiac surgery
3. Patients with established heart failure
4. Patients with chronic kidney disease

Study Size. This study used a sampling method which included all data from young patients aged 18-40, who had transthoracic echocardiography from January 2021 to December 2022 at NDCH. Ideal sample size computed from a population size of 444 is 208. Simple

randomization was used by listing the patients and getting those assigned to the odd numbers to identify the 208 patients included in the study.

Data Collection and Statistical Plan. The data gathering was personally done by the researcher. The study used a retrospective data from charts of eligible patients in the medical records for in-patients and from out-patient records, using a data collection form. A letter of request for chart review was sent to the hospital administrator for access of medical information.

For the 2DED part, only results read by Level 3 echocardiographers were included in the study. The baseline echocardiographic parameters were recorded and the results were evaluated for presence of the different patterns of LV remodeling. LV remodeling was defined based on measurement of LVMI and RWT: concentric remodeling (normal LVMI and increased RWT), eccentric hypertrophy (increased LVMI and normal RWT), and concentric hypertrophy (both LVMI and RWT are increased).

RWT was be computed by the formula where RWT is equal to twice the posterior wall thickness at end diastole divided by the LV end diastolic diameter (2 × PWD)/LVEDD). RWT values ≥ 0.42 and LVMI ≥ 115 g/m² for men and ≥ 95 g/m² for women were considered abnormal. The subjects were grouped into four: normal geometry, concentric remodeling, concentric hypertrophy, and eccentric hypertrophy, according to the Guidelines of the American Society of Echocardiography.

Descriptive statistics using frequency and percentages were employed to describe the clinical profiles of patients according to age, sex, BMI, co-morbidities, and presence of symptoms.

Chi-square tests were employed to assess the significance of associations of patients' clinical profile with the different patterns of LV remodeling and to determine the independent predictors of LV remodeling in young patients. The analysis of the echocardiographic parameters of ventricular remodeling patterns were conducted through ANOVA followed by post-hoc tests for significant F values to provide insights into the differences of means across various cardiac parameters.

All data were calculated using Statistical Package for Social Survey (SPSS(R)) for Windows. The results were tabulated and graphically represented using Microsoft Office for Windows.

Definition of Terms

1. *Left Ventricular Remodeling:* defined based on measurement of left ventricular mass index (LVMI) and relative wall thickness (RWT)
2. *Young adult patients:* patients aged 18-40 years old
3. *Concentric Remodeling:* normal Left Ventricular Mass Index and increased Relative Wall Thickness
4. *Concentric Hypertrophy:* both Left Ventricular Mass Index and Relative Wall Thickness are increased
5. *Eccentric Hypertrophy:* increased Left Ventricular Mass Index and normal Relative Wall Thickness
6. *Obesity:* defined according to standard body mass index (BMI) cutoffs defined by Asia Pacific classification (underweight, BMI <18.5 kg/m^2; normal, BMI 18.5 – 22.9; overweight, BMI ≥23-24.9 kg/m^2; obese, BMI ≥25 kg/m^2).
7. *Level 3 echocardiographers:* as defined by Philippine Heart Association, Council on Echocardiography, Philippine Society of Echocardiography, is acquired by undergoing 1 year research fellowship in echocardiography post cardiology training.

Results

Table I shows the baseline characteristics of patients aged 18-40 who underwent transthoracic echocardiography from January 2021 to December 2022. Majority of the patients belonged to the age group of 31-40 years old (n=134/208, 64.4%). Age distribution, with categories spanning 18-30 and 31-40, showed a $p = 0.166$, indicating no significant trend between age groups and the observed frequencies.

Majority of the patients were female (n=114/208, 54.8%) while the male patients comprised 45.2%(n=94/208). The distribution of patients by sex exhibited a highly significant a $p =- 0.000$, emphasizing a notable trend in the distribution.

The BMI Classification demonstrated a significant distribution, suggesting a substantial proportion of patients being obese (as evidenced by an expected count of 52 for obesity, while the actual count was 110), followed by normal weight (24.5%), overweight (19.2%), and underweight (3.4%).

The analysis of comorbidities showed varying percentages per comorbidity, with hypertension being the most prevalent at 19.7%, followed by diabetes mellitus at 4.8%, congenital heart disease at 1.4% and rheumatic heart disease at 0.5%, and the distribution of comorbidities within the dataset accounted for 93.2% of total responses.

The presence of symptoms was also examined, revealing percentages per symptom and their contribution to the overall distribution. Notably, other symptoms had the highest percentage at 15.8%, followed by angina at 4.8%, shortness of breath/Dyspnea at 2.8% and easy fatigability at 2.4%. Other symptoms contributed significantly to the overall distribution, accounting for 70.2% of total responses.

The dataset, comprising 208 cases, reveals a diverse range of health conditions. The majority of cases fall under the broad category of Others (specified).' Within this category, specific cardiovascular issues are prevalent, including acute perimyocarditis, coronary artery disease (CAD), and related conditions such as CAD with rheumatoid arthritis and palpitations. Additionally, cases involving cardiovascular diseases (CVD) alone or in conjunction with CAD contribute significantly to the dataset. Noteworthy symptoms include dizziness in connection with CVD, loss of consciousness, and palpitations. Other isolated cases involve issues like

Table I. Baseline characteristics of patients aged 18-40 who underwent transthoracic echocardiography from January 2021 to December 2022

	No. of patients (n=208)	%	P value
Age			0.166
18-30	74	35.6	
31-40	134	64.4	
Sex			0.000***
Male	94	45.2	
Female	114	54.8	
BMI Classification			0.000***
Underweight	7	3.4	
Normal Weight	51	24.5	
Overweight	40	19.2	
Obese	110	52.9	
Comorbidities			
HPN	41	19.7	
DM	10	4.8	
RHD	1	0.5	
CHD	3	1.4	
Symptoms			
Easy Fatigability	5	2.4	
Angina	10	4.8	
Sob/Dyspnea/ Orthopnea	6	2.8	
Others	33	15.8	

*** Statistically significant

Table II. Prevalence of LV remodeling in Patients Aged 18-40

	No. of patients, (%) n:208
Normal geometry	141 (67.7)
LV remodeling	67 (32.2)
Concentric Remodeling	40 (19.23)
Concentric Hypertrophy	13 (6.25)
Eccentric Hypertrophy	14 (6.73)

obstructive sleep apnea, mitral valve prolapse, and polycythemia. Pregnancy-related uterine conditions also make an appearance. Syncope, a temporary loss of consciousness, is reported in one case. The dataset is rounded out by cases of transient ischemic attack.

In summary, this analysis provides a comprehensive understanding of the distribution of baseline data, emphasizing significant associations between sex, BMI classification, and the prevalence of certain comorbidities and symptoms among patients.

Among the 208 young patients, 32.21% had evidence of Left ventricular remodeling while 67.7% are of normal geometry (*Table II*).

Table III shows the association of the clinical profile and LV remodeling in transthoracic echocardiography. It provides valuable insights into the relationship between various factors and LV geometry. Chi-square tests were employed to assess the significance of associations, with the following results:

1. *Age Group:* The distribution of patients across age groups showed no significant association with LV remodeling ($\chi2 = 3.756$, $p = 0.289$). Across the age groups of 18-30 and 31-40, patients were distributed among normal geometry, concentric remodeling, concentric hypertrophy, and eccentric hypertrophy.
2. *Sex:* The analysis of sex-related differences revealed a non-significant association with LV remodeling ($\chi2 = 4.462$, $p = 0.216$). Males and females exhibited varying proportions across the different LV remodeling categories.
3. *BMI Classification:* BMI Classification demonstrated a significant association with LV remodeling ($\chi2 = 25.457$, $p = 0.003$**). Notably, obese patients had a higher prevalence of concentric hypertrophy, while normal weight patients were more likely to have normal LV geometry.
4. *Comorbidities*: The presence of comorbidities showed no significant association with LV remodeling ($\chi2 = 13.311$, $p = 0.347$). The frequencies of comorbidities such as hypertension (HPN), diabetes mellitus (DM), rheumatic heart disease (RHD), and congenital heart disease (CHD) varied across different LV remodeling categories.
5. *Presence of Symptoms*: Similarly, the presence of symptoms exhibited no significant association with LV remodeling ($\chi2 = 6.622$, $p = 0.882$). Symptoms such as easy fatigability, angina, shortness of breath/dyspnea/orthopnea, and other symptoms were distributed diversely among the LV remodeling categories.

In summary, while there is a significant association between BMI classification and LV remodeling, no significant associations were observed for age, sex, comorbidities, and the presence of symptoms. These findings provide crucial insights into the complex relationship between clinical profiles and LV remodeling, contributing to a more comprehensive understanding of cardiovascular health.

The analysis of ventricular remodeling patterns, conducted through a One-way Analysis of Variance (ANOVA) followed by post-hoc tests for significant F values, provides insights into the differences of means across various cardiac parameters. The results are presented as means with standard deviations in parentheses (*Table IV*).

1. *Left Ventricular Ejection Fraction (LVEF)*: The ANOVA did not reveal a significant difference in LVEF among different ventricular remodeling patterns ($F = 1.503$, $p = 0.215$).
2. *Left Ventricular Mass Index (LVMI):* LVMI demonstrated a significant difference across remodeling patterns ($F = 17.070$, $p = 0.000$***). Post-hoc tests (Duncan) showed that LVMI in the concentric hypertrophy group was not significantly higher than in the normal geometry group ($p = 0.190$).
3. *Left Ventricular Relative Wall Thickness (LV RWT)*: LV RWT exhibited a significant difference across remodeling patterns ($F = 41.182$, $p = 0.000$***). Post-hoc tests indicated no significant differences between

Table III. Association of the Clinical Profile and LV Remodeling as Shown in Transthoracic Echocardiography

	NG	CR	CH	EH	Total	P Value
Age						0.289
18-30	55	9	5	5	74	
31-40	86	31	8	9	134	
Sex						0.216
Male	64	21	7	3	94	
Female	78	19	6	11	114	
BMI Classification						0.003***
Underweight	7	0	0	0	7	
Normal Weight	40	6	0	5	51	
Overweight	34	4	1	1	40	
Obese	60	30	12	8	110	
Comorbidities						0.347
HPN	21	11	4		41	
DM	6	4	0	5	10	
RHD	0	0	0	0	1	
CHD	1	1	0	1	3	
Symptoms				1		0.882
Easy Fatigability	0	1	2	2	5	
Angina	1	2	1	6	10	
Sob/Dyspnea/Orthopnea	0	0	2	4	6	
Others	2	5	5	21	33	

NG = Normal geometry; CR = Concentric remodeling; CH = Concentric hypertrophy; EH = Eccentric hypertrophy

Table IV. Echocardiographic Parameters of Young Patients Characterized by LV Remodeling Patterns

	Pattern of LV Remodling				General Mean	P Value
	NG	CR	CH	EH		
LVEF (%)	62.79 (4.83)	62.6 (4.51)	60.15 (7.38)	61.00 (6.29)	62.47 (4.83)	0.215
LVMI (g/m^2)	77.21 (19.90)	85.89 (15.28)	105.72 (28.74)	113.38 (42.93)	83.10 (24.39)	0.000***
LV RWT (cm)	0.37 (0.06)	0.50 (0.11)	0.55 (0.17)	0.38 (0.07)	0.40 (0.10)	0.000***
LAVi (ml/m^2)	20.55 (6.48)	20.79 (7.59)	27.33 (10.40)	33.89 (13.62)	21.93 (8.39)	0.000***
EDVi (ml)	94.67 (25.51)	80.96 (22.60)	93.77 (32.87)	129.71 (42.99)	94.33 (28.89)	0.000***
LVEDD (cm)	4.49 (0.43)	4.74 (3.31)	4.43 (0.59)	4.98 (0.60)	4.57 (1.50)	0.563
IVSD (cm)	0.89 (0.18)	1.06 (0.20)	1.16 (0.17)	1.09 (0.18)	0.96 (0.20)	0.000***
PWD (cm)	0.82 (0.15)	1.03	1.15 (0.21)	1.00 (0.17)	0.89 (0.20)	0.000***

NG = Normal geometry; CR = Concentric remodeling; CH = Concentric hypertrophy; EH = Eccentric hypertrophy
LVEF = Left ventricular ejection fraction; LVMI = Left ventricular mass index; LV RWT = Left ventricular relative wall thickness; LAVi = Left atrial volume index; EDVi = End diastolic volume index; LVEDD = Left ventricular end diastolic diameter; IVSD = Interventricular septum at end diastole; PWD = Posterior wall thickness at end diastole

normal geometry and eccentric hypertrophy (*p = 0.3764*) and between concentric hypertrophy and eccentric hypertrophy (p = 0.5531).

4. *Left Atrial Volume Index (LAVi*): LAVi showed a significant difference across remodeling patterns (F = 15.482, *p = 0.000****). Post-hoc tests did not reveal significant differences among the groups.
5. *End-Diastolic Volume Index (EDVi):* EDVi demonstrated a significant difference across remodeling patterns (F = 11.348, *p = 0.000****). Post-hoc tests indicated no significant differences between the LV remodeling group and both the concentric hypertrophy (*p = 0.111*) and eccentric hypertrophy groups (*p = 1.000*).
6. *Left Ventricular End-Diastolic Diameter (LVEDD), Interventricular Septal Thickness in Diastole (IVSD),* and *Posterior Wall Thickness in Diastole (PWD)*: LVEDD, IVSD, and PWD did not exhibit significant differences across ventricular remodeling patterns (LVEDD: F = 0.684, *p = 0.563*; IVSD: F = 17.740, *p = 0.000****; PWD: F = 30.887, *p = 0.000****).

In conclusion, this analysis underscores significant differences in LVMI, LV RWT, LAVi, EDVi, IVSD, and PWD among ventricular remodeling patterns. Post-hoc tests further elucidate specific group differences in LVMI, LV RWT, and EDVi, contributing valuable insights into the cardiac structural variations associated with different remodeling patterns.

Discussion

Our study included two hundred eight (208) patients aged 18-40 years old. Majority were aged 31-40 (64.4%) , female (54.8%) , and under the BMI classification of obese (52.9%). The presence of comorbidities showed varying percentages per comorbidity, with Hypertension

(HPN) being the most prevalent at 19.7%, followed by Diabetes Mellitus (DM) at 4.8%, Congenital Heart Disease (CHD) at 1.4% and Rheumatic Heart Disease (RHD) at 0.5%, and the distribution of comorbidities within the dataset accounted for 93.2% of total responses. The presence of symptoms was also examined. Notably, 'Other Symptoms' had the highest percentage at 15.8%, followed by Angina at 4.8 %, Shortness of breath/Dyspnea/Orthopnea at 2.8 % and Easy Fatigability at 2.4 %.

Adaptive response to aging and exposure to risk factors for cardiovascular disease leads to ventricular remodeling. As to the exact age when these structural changes are readily observed, it is yet to be established. With the rising and earlier cardiovascular diseases observed in the younger population, a timely risk identification is warranted.

During this time where echocardiographic studies are readily available, it is important to maximize its use for the earlier detection of cardiovascular disease in the at- risk population, while taking into consideration its financial cost- effectiveness. This study aims to identify the age and clinical profile of the population that will benefit from an earlier detailed echocardiographic evaluation.

Principal Findings. In this study of young patients aged 18-40 years old with transthoracic echocardiography, several insights into the prevalence of left ventricular remodeling and its associated factors emerged. First, LV remodeling can already be observed in this population, as high as 32.21 % of the total subjects. Of the patients with LV remodeling, majority (59.7%) were classified under LV concentric remodeling pattern.

Second, a substantial proportion of patients were obese (as evidenced by an expected count of 52 for obesity, while the actual count was 110) and the study demonstrated a significant association of BMI classification with LV remodeling. Notably, obese patients had a significantly higher prevalence of concentric remodeling, while normal weight patients were more likely to have normal LV geometry. Of the 7 underweight patients in the study, all had a normal LV geometry.

Third, though statistically not significant, among the 41 (19.7%) hypertensive patients included in the study, 51% were of normal geometry and 49 % were distributed among the three LV remodeling patterns.

Prior Studies. Epidemiological data on the prevalence and incidence of changes in ventricular geometry have focused on participants who were middle-aged or older, with related co-morbidities. In a study among individuals between the ages of 45 and 99 years in Rio de Janeiro, Brazil, prevalence of altered LV remodeling patterns was at 33%.[16] In another study of 795 young persons in Egypt, with an age range between 20 and 31 years, referred for routine echocardiography assessment as a screening test before employment, only 9 persons had structural cardiac abnormalities (1.3%).[17] While in the Bogalusa Heart Study, among 1,061 adults aged 24 to 46 years (mean, 37.7), the cross- sectional prevalence of LV remodeling was 24% overall.[18] And lastly, in the analysis of data from the Coronary Artery Risk Development in Young Adults Study with participants of 2,833, it showed that LV remodeling is already present by young adulthood, with an overall probability of at least 10% by age 25 years, 25% by age 45 years, and 45% by age 60 years.[7]

The prevalence of LV remodeling was variable in these studies; however, it only proves that LV remodeling can already be detected in the young population.

Obesity correlates with higher blood pressure and with adverse serum lipoprotein changes. In a longitudinal study of 1,061 adults, age 24 to 46 years, who had been examined 4 or more times for body mass index (BMI) and BP starting in childhood, with a mean follow-up of 28 years, it demonstrated that childhood and adult values and long-term cumulative burden and trends of BMI and BP are all-powerful predictors of adult LVH and its remodeling patterns. BMI has a consistently greater impact on LVH than BP. These results support the notion that the adverse long-term influence of BMI and BP levels on the development of LVH begins in childhood, and the dual burden of excessive adiposity and elevated BP affects LV enlargement cumulatively during the lifetime.[18]

This current analysis supports these prior findings in the following ways. First, we have showed that LV remodeling may start as early as young adulthood, at ages 18-40 years old, and second, we identified obesity as a risk factor for the development of adverse LV remodeling pattern, specifically concentric remodeling pattern.

Implications. The demonstration of LV remodeling pattern in young adult patients gives credibility to risk-factor examination of young children and adults, and the need for beginning of prevention in early life.

Hypertension and Diabetes Mellitus (CAD equivalent) cause LV remodeling in the general population, however were not identified in this study as compared to BMI. This is primarily because majority of the participants were obese but many were as yet hypertensive or diabetic. Moreover, a five-year collection of data, even though retrospective, might have resulted in a more robust conclusion because more participants in this age group will have been recruited.

The findings in this analysis identifies obese and hypertensive individuals as a potential population which may benefit from earlier detailed echocardiographic examination and intensive risk factor control

Conclusion

LV remodeling is already prevalent in young adults aged 18-40 years old. BMI classification demonstrated a significant association with LV remodeling pattern. Obesity showed a significant association with concentric remodeling pattern.

Limitations and Recommendations

The study utilized a retrospective cross-sectional study design to determine the prevalence of LV remodeling in the young cardiac patients and the association of the clinical profile with LV remodeling. A prospective study design would have derived a better understanding of the association of the clinical profile with LV remodeling since the data gathered would have been complete. Generalizability of the study is difficult to establish because adequate representation of the community cannot be attained due to the fact that the majority of subjects included in the study either have an existing medical condition or risk factors prompting the need for the echocardiographic study.

The researchers recommend that a prospective study be done by future interested investigators to acquire a more accurate data especially on the reason for testing and the inclusion of pertinent data such as SBP, lipid profile and other significant risk factors. If feasible, a randomized selection of participants from the community is recommended.

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