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Sudanese hypertensive patients: A two dimensional Echocardiographic based study

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Abstract:
Objectives*: The goal of this hospital-based study was to evaluate the two dimensional echocardiographic parameters for hypertension patients*
Materials and Methods*: This research was carried out in Elshaab Teaching Hospital in Khartoum, Sudan, during the period extended from August 2016 to August 2019.The study comprised of 51 adult Sudanese hypertensive patients and 48 healthy subjects' .The participants were of both genders and ranged from 30 to 90 years old. Patients who were pregnant or had genetic problems, heart defects, or any abnormalities other than hypertension were eliminated. The variables were age, gender, height, weight, and clinical history, which were all recorded on a well-designed data sheet. Left ventricular dimensions including (left ventricular septum (LVS), left ventricular internal diameter in diastole and systole (LVIDd&s), left ventricular posterior wall in diastole and systole (LVPWDd &s), left ventricular end diastolic volume (LVEDV) and left ventricular end systolic volume (LVESV), left ventricular ejection fraction (LVEFF), left ventricular mass (LVM) and Aortic root, diameter and Left Atrial diameters were measured and evaluated. The used ultrasound machines were (TOSHIBA,XARIO200, SAMSUNG, MYLAB50XVISION CARDIOVASCULA).The apical window views (PA2CH, PA4CH (two and four chambers) and parasternal long and short-axis (PLAX & PSAX) were utilized. The relations between all of the study's parameters with gender, age, and body mass index have been assessed.IBM SPSS version 25 was used to analyze the data.*
Results*: In systole, the LVM and Aortic pathway were both enhanced when compared to normal patients at p-values 0.000 and 0.066, respectively. Left ventricular volumes (EDVand ESV) were significantly increased at p-values 0.000 and 0.003 respectively. The echocardiographic parameters of hypertensive patients were found to be elevated than the average values when compared with normal individuals. In relation to all demographic data; fraction shortening and LVESV were significantly increased with age at p-values 0.004 and 0.003 respectively, and LVEDV at p-value 0.000.The relations between BMI, the left atrial to aortic ratio and hypertensive duration were highly significant. There are no significant relations between gender with any of the characteristics.*
Conclusion: *The study revealed that the two-dimensional transthoracic echocardiographic measures were increased with elevated blood pressure therefore the study acknowledged the evaluation of the above parameters as routine inspect for hypertensive patients.*
Key Word:2D Echocardiography; Normal subjects, hypertension

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I. Introduction

Echocardiography is one of the most regularly used imaging tools, and it has provided insights into pathophysiology and clinical consequences in patients with hypertension, as well as the ability to discern structural and functional changes in a real-time, quick, and repeatable manner. The diagnosis of asymptomatic organ damage that can be utilized to determine cardiovascular risk is more sensitive using echocardiography. As a result, it is critical in the clinical care of some hypertensive patients [1].Hypertrophy of the left ventricle (LV) may be a physiological response to an increased work load on the heart as a result of intense physical activity.LV hypertrophy, on the other hand, is frequently a psychophysiology condition that can occur as a result of intrinsic stimuli (cardiomyopathy) or external stimuli (pressure or volume overload associated with hypertension and Valvular disease). Myocardial hypertrophy is a common sign in individuals with congestive heart failure caused by systolic and/or diastolic LV dysfunction, and it is part of the remodeling process

following an acute myocardial infarction. [2].The percentage of blood ejected into the aorta by the left ventricle during systole is known as the left ventricular ejection fraction. Its value is calculated from the sum of final systolic and diastolic volumes in the ventricles on an echocardiography, and patients with lower systolic blood pressure have a lower LVEF.Heart failure is a pathophysiological condition in which an aberration in cardiac function causes the heart to fail to pump blood at a rate that matches the needs of metabolizing tissues under normal cardiac weights. Some of the blood in the left ventricle is squeezed and pumped out to the body via the left ventricle. An ejection fraction of more than 55 percent is considered typical. This means that with each pulse, 55 percent of the blood in the left ventricle is pumped out. Heart failure with reduced ejection fraction can be caused by a variety of factors, including high blood pressure, which causes the heart to work harder to pump against greater pressure, weakening the muscle[3].The goal of this study is to distinguish how hypertension might have an effect on echocardiographic measurements.

II Materials and Methods

This hospital-based retrospective study included 51 hypertensive patients and 48 healthy subjects with both gender. Their ages ranged from 30 to 90 years old. The data were collected during the period extended from 2016 up to 2019 at Elshaab Teaching Hospital's echocardiographic unit in Khartoum- Sudan. The study's variables were divided into two classes (normal and Hypertensive patients). Hypertension's effects on left ventricular dimensions, mass, aorta, left atrial diameter measurements, ejection fraction as well as their relationship to demographic variables had been studied and were compared to normal subjects.

Inclusion criteria

Hypertensive individuals with various clinical indications and symptoms utilizing echocardiography examination as well as normal subjects as control had been participated.

Exclusion criteria:

Pregnant women, patients with genetic problems, and patients with any abnormalities other than hypertension.

Procedure/ methodology

During the Cardiologist's examination, a well-designed data sheet was used to register the patients' data. The data sheet included demographic information (age, gender, height, weight, and clinical history) .The evaluated Echocardiographic parameters were: (the left ventricular septum (LVS), left ventricular internal diameter in diastole and systole (LVIDd,s), and left ventricular posterior wall in diastole and systole (LVPWDd,s), LVEDV (left ventricular end diastolic volume), LVESV (left ventricular end systolic volume), LVEF (left ventricular ejection fraction), LVM (left ventricular mass), and AOD (aortic diameter) . All echocardiographic parameters were measured using various ultrasound machines (TOSHIBA, XARIO200, SAMSUNG, MYLAB50XVISION CARDIOVASCULA) using high frequency probes. The following techniques were used: During each exam, Teichholz's M-Mode of 2D echocardiography calculated parasternal long and short-axis (PLAX & PSAX) and apical window views (PA2CH, PA4CH (two and four chambers).The diameter of the aortic root was measured from the anterior to the posterior aortic root (leading edge to leading edge), and the left atrial diameter (LAD) was measured in the parasternal long axis view at the level of the aortic sinuses by using the leading edge to leading edge convention. [4] (LV Mass = 0.81.04[([LVEDD + IVSd + PWd] 3 - LVEDD3)] + 0.6) A uniform approach was used to measure Left ventricular mass [5]. The body mass index (BMI) was computed by multiplying the weight in kilograms (minus 1 kg for clothing) by the height in meters squared [6]. The patient's blood pressure was recorded on the exam request form.

All of the study's variables were classified into six categories, including:

Left ventricular dimensions and mass were correlated to the duration of hypertension in both normal participants and hypertensive patients.

Left ventricular volume had been evaluated in normal participants and hypertension patients.

Left ventricular ejection fractions were measured and compared to other metrics in both hypertensive and normal groups.

Aorta and left atrial diameters were measured in normal participants and hypertension patients.

Association between all study parameters and gender were investigated in normal participants and hypertension group.

Association between all study parameters and age and BMI was evaluated in normal participants and hypertensive patients.

Statistical analysis

IBM SPSS (Statistical Package for the Social Sciences) Statistics version 25 was used to examine the data. The Chi-square test was used to assess categorical variables, which were reported as numbers and percentages. Continuous variables were represented as mean STDV and evaluated using Student's t-test and ANOVA for variables that passed normality tests and Mann–Whitney U-test for those that failed normality testing. Pearson's correlation coefficient was used to examine correlations (r). P-Value of less than 0.05 was judged statistically significant, and a p-value of less than 0.0001 was deemed extremely significant

II. Results

Table 1: Showed Mean ± stander deviation values of left ventricular internal diameter in diastole (LVIDd), LVIDs (left ventricular internal diameter in systole),IVS d(inter ventricular septum in diastole), LVPWd (left ventricular posterior wall in diastole), LVPWs(left ventricular posterior wall in systole) & LVM(left ventricular mass) for both groups (normal subjects and hypertensive patients)

Parameter	Hypertensive patients			Normal subjects		
	Maximum	Minimum	Mean±SD	Maximum	Minimum	Mean±SD
Interventricular septum dimension (IVSD) /cm	11.3	0.7	1.4 ± 1.5	4	0.2	0.9 ± 0.5
Left ventricular internal diameter in diastole (LVIDd)/ cm	10.7	3.1	5.4 ± 1.5	6	1.8	3.8 ± 1.1
Left ventricular posterior wall diameter in diastole (LVPWd/)/cm	7.4	1.0	1.2 ± 1.0	4.9	0.1	1.1 ± 1.2
Left ventricular posterior wall in systole (LVPWs)/cm	0.0	8.4	1.2 ± 1.2	0.79	0.0	2.4 ± 0.8
Left ventricular mass (LVM) / g	839.0	89.0	221.8 ± 122.4	528.0	54.0	90.2 ± 48.7

Table no 2: Showed mean ± SD of diastolic pressure/mmHg and systolic blood pressure/mmHg for hypertensive patients and healthy participants.

Parameter	Hypertensive patients			Normal subjects		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean
DIASTOLE /mmHg	110	70	86.9 ± 11.5	94	70	78.0 ± 5.3
SYSTOLE/ mmHg	200	17	130.4 ± 30.6	141	110	118.1 ± 6.4

Table 3: Showed the mean ± standard deviation of LVEDV (left ventricular end diastolic volumes) and LVESV (left ventricular end systolic volume) in normal subjects and hypertensive patients.

Parameter	Hypertensive patients			Normal subjects		
	Maximum	Minimum	Mean ±SD	Maximum	Minimum	Mean ±SD
Left ventricular end diastolic volume(LVEDV)/ ml	379	36.4	130.5 ± 65.4	217.6	9.4	77.9 ± 48.6
Left ventricular end systolic volume (LVESV) / ml	310	11.3	64.6 ± 53.6	134.6	7.4	36.4 ± 24.0

Table 4: Showed normal echocardiographic findings, LVH (left ventricular hypertrophy), myocardial ischemia with DCM (dilated cardiomyopathy and IHD (ischemic heart disease) are presented as frequency and percentages of final diagnosis in 51 hypertensive patients.

Final Diagnosis	Frequency	Percent
Left ventricular hypertrophy	17	33.30%
Normal echo findings	21	41.20%
Dilated cardiomyopathy	5	9.80%
Ischemic heart disease	8	15.70%
Total	51	100.00%

Table 5: showed the left ventricular ejection fraction in healthy subjects and hypertensive patients.

Parameter	Hypertensive patients			Normal subjects		
	Maximum	Minimum	Mean ±SD	Maximum	Minimum	Mean ±SD
Left ventricular Ejection fraction (LVEF %)	75.5	18.2	54.5 ± 14.8	83.9	31	64.2 ± 8.8

Table 6: showed the comparison of all parameters in both normal subjects and hypertensive patients.

Parameters	Normal subjects	Hypertensive patients	P-value
Age/year	44.4 ± 11.6	56 ± 13.7	0.000*
Weight/kg	64.1 ± 14.2	75.5 ± 21.0	0.000*
Height/cm	159.0 ± 11.0	169.3 ± 11.2	0.000*
Body max index BMI kg/cm^3	25.3 ± 7.2	26.2 ± 6.3	0.113
Interventricular septum dimension(IVSD)/cm	0.9 ± 0.5	1.4 ± 1.5	0.027*
Left ventricular internal diameter in diastole LVIDd/cm	3.8 ± 1.1	5.4 ± 1.5	0.000*
Left ventricular posterior wall diameter in diastole LVPWd/cm	1.1 ± 1.2	1.2 ± 1.0	0.891
Left ventricular end diastolic volume (LVEDV)/ml	77.9 ± 48.6	130.5 ± 65.4	0.000*
Left ventricular end systolic volume LVESV/ml	36.4 ± 24.0	64.6 ± 53.6	0.003*
Left ventricular Ejection fraction (LVEF)%	64.2 ± 8.8	54.5 ± 14.8	0.000*
Left ventricular Ejection fraction (LVFS)%	34.8 ± 6.6	29.3 ± 9.1	0.004*
Left ventricular internal diameter in systole (LVIDs)/cm	2.4 ± 0.8	7.7 ± 26.2	0.392
Left ventricular posterior wall in systole (LVPWs)/cm	1.1 ± 0.6	1.2 ± 1.2	0.528
Aortic diameter(AOD)/cm	2.3 ± 0.8	3.6 ± 4.6	0.066
Left atrial diameter(LAD)/cm	2.8 ± 1.1	4.5 ± 5.1	0.027*
Aortic diameter /Left atrial diameter AO/LA %	1.3 ± 0.3	1.5 ± 0.4	0.263
Left ventricular mass (LVM) / g	90.2 ± 48.7	221.8 ± 122.4	0.000*

Table 7: showed the mean ± STDV of aorta and left atrial diameters in hypertension patients and normal subjects.

Parameter	Hypertensive patients			Normal subjects		
	Maximum	Minimum	Mean±SD	Maximum	Minimum	Mean±SD
Aortic diameter(AOD)/cm	3.0	1.2	3.6 ± 4.6	4.3	1.3	2.3 ± 0.8
Left atrial diameter(LAD)/cm	3.9	1.3	4.5 ± 5.1	4.6	0.7	2.8 ± 1.1

Table 8: Showed the association between all parameters and gender in normal participants and hypertensive patients

parameters	Hypertensive patients			Normal subjects		
	Gender		P-value	Gender		P-value
	Female	Male		Female	Male	
Age/year	55.0 ± 13.7	57.8 ± 13.9	0.499	43. ± 9.7	46.5 ± 15.0	0.381
Weight/kg	74.6 ± 21.4	77.1 ± 21.0	0.685	63.3 ± 13.7	65.8 ± 15.3	0.561
Height/cm	168.3 ± 10.3	171.2 ± 12.8	0.389	157.0 ± 13.7	163.3 ± 9.3	0.06
Body max index BMI kg/cm^3	26.6 ± 6.6	25.5 ± 5.8	0.555	25.2 ± 6.4	25.5 ± 8.9	0.896
Hypertension Duration	6.7 ± 5.3	7.9 ± 6.8	0.47	104.9 ± 16.0	107.9 ± 13.5	0.518
Interventricular septum dimension(IVSD)/cm	1.2 ± 0.2	1.8 ± 2.5	0.169	0.9 ± 0.6	0.8 ± 0.2	0.425
Diastole	88.2 ± 12.4	84.6 ± 9.7	0.295	77.4 ± 4.9	79.4 ± 6.1	0.206

Systole	127.5 ± 34.1	135.9 ± 22.7	0.352	117.7 ± 6.0	118.8 ± 7.3	0.582
Left ventricular internal diameter in diastole LVIDd/cm	5.2 ± 1.3	5.8 ± 1.8	0.144	3.7 ± 1.2	4.2 ± 1.0	0.164
Left ventricular posterior wall diameter in diastole LVPWd/cm	1.0 ± 0.5	1.4 ± 1.5	0.22	0.9 ± 0.4	1.5 ± 2.1	0.097
Left ventricular end diastolic volume (LVEDV)/ml	121.0 ± 50.4	147.8 ± 85.4	0.164	70.1 ± 44.0	94.0 ± 54.9	0.106
Left ventricular end systolic volume LVESV/ml	54.9 ± 29.6	82.5 ± 79.2	0.078	30.9 ± 15.7	47.6 ± 33.4	0.021*
Left ventricular Ejection fraction (LVEF)%	55.7 ± 12.0	52.4 ± 19.1	0.452	64.2 ± 9.7	64.0 ± 7.0	0.939
Left ventricular fraction shorten (LVFS)%	30.0 ± 7.7	28.0 ± 11.3	0.454	34.9 ± 7.3	34.7 ± 5.1	0.891
Left ventricular internal diameter in systole (LVIDs)/cm	3.8 ± 1.4	4.3 ± 1.8	0.281	2.4 ± 0.8	2.6 ± 0.9	0.458
Left ventricular posterior wall in systole (LVPWs)/cm	1.1 ± 0.5	1.3 ± 1.8	0.602	1.1 ± 0.6	1.3 ± 0.7	0.114
Aortic diameter(AOD)/cm	2.7 ± 0.6	5.2 ± 7.5	0.055	2.3 ± 0.7	2.5 ± 1.0	0.44
Left atrial diameter(LAD)/cm	3.9 ± 0.8	5.6 ± 8.6	0.271	2.9 ± 1.1	2.8 ± 1.0	0.714
LVM	237.4 ± 171.5	213.2 ± 87.0	0.506	105.6 ± 50.9	82.8 ± 46.6	0.125

Table 9: showed the relationship between all study variables with Age and BMI in normal subjects

Variables	Normal subjects			
	Age		BMI	
	Pearson Correlation (r)	P-value	Pearson Correlation (r)	P-value
Blood sugar	-0.081	0.582	0.035	0.814
Interventricular septum dimension(IVSD)/cm	0.015	0.919	0.056	0.704
Diastole	0.11	0.452	-0.086	0.556
Systole	-0.021	0.888	-0.077	0.599
Left ventricular internal diameter in diastole LVIDd/cm	0.048	0.741	-0.097	0.508
Left ventricular posterior wall in systole (LVPWs)/cm	0.021	0.886	-0.243	0.093
Left ventricular end diastolic volume (LVEDV)/ml	-0.092	0.53	-0.116	0.426
Left ventricular end systolic volume LVESV/ml	-0.064	0.66	-0.091	0.532
Left ventricular Ejection fraction (LVEF)%	-0.174	0.233	0.013	0.93
Left ventricular fraction shorten (LVFS)%	-0.224	0.121	0.006	0.967
Left ventricular internal diameter in systole (LVIDs)/cm	0.122	0.405	-0.023	0.876
Left ventricular posterior wall in systole (LVPWs)/cm	0.266	0.064	0.015	0.917
Aortic diameter(AOD)/cm	0.288*	0.045	0.022	0.88
Left atrial diameter(LAD)/cm	0.103	0.482	0.059	0.685
Aortic to left atrial ratio AO/LA /%	0.398*	0.005	0.286*	0.046
Left ventricular mass LVM/g	0.323*	0.024	-0.062	0.672

Table 10: showed the relationship between all study variables with Age and BMI in Hypertensive patients

Variables	Hypertensive patients			
	Age		BMI	
	Pearson Correlation (r)	P-value	Pearson Correlation (r)	P-value
Duration	0.169	0.237	0.286*	0.042

Interventricular septum dimension(IVSD)/cm	0.272	0.054	0.161	0.258
Diastole	0.059	0.683	0.069	0.63
Systole	0.029	0.84	-0.08	0.577
Left ventricular internal diameter in diastole LVIDd/cm	0.162	0.256	-0.057	0.691
Left ventricular posterior wall in systole (LVPWd)/cm	0.352*	0.011	-0.02	0.887
Left ventricular end diastolic volume (LVEDV)/ml	0.208	0.143	-0.061	0.669
Left ventricular end diastolic volume (LVEDV)/ml	0.326*	0.02	-0.189	0.185
Left ventricular end systolic volume LVESV/ml	-0.258	0.068	0.146	0.308
Left ventricular Ejection fraction (LVEF)%	-0.299*	0.033	0.192	0.177
Left ventricular fraction shorten (LVFS)%	0.263	0.062	-0.164	0.249
Left ventricular internal diameter in systole (LVIDs)/cm	0.347*	0.013	0.036	0.804
Left ventricular posterior wall in systole (LVPWs)/cm	-0.187	0.188	-0.101	0.48
Aortic diameter(AOD)/cm	-0.07	0.625	-0.101	0.48
Left atrial diameter(LAD)/cm	0.123	0.388	0.008	0.954
Aortic to left atrial ratio AO/LA /%	0.118	0.409	0.097	0.496
Left ventricular mass (LVM)/g	0.118	0.409	0.097	0.496
LVM	0.323*	0.024	-0.062	0.672

Table 11: Correlating Hypertensive Patients' Duration, diastole, and systole with Other Parameters

variables	Duration		Diastole		Systole	
	Pearson Correlation (r)	P-value	Pearson Correlation (r)	P-value	Pearson Correlation (r)	P-value
Interventricular septum dimension(IVSD)/cm	0.529	0.000	-0.067	0.641	-0.044	0.761
Left ventricular internal diameter in diastole LVIDd/cm	0.079	0.58	-0.021	0.885	0.061	0.671
Left ventricular posterior wall diameter in diastole LVPWd/cm	-0.042	0.77	0.076	0.597	-0.026	0.858
Left ventricular end diastolic volume (LVEDV)/ml	-0.113	0.429	0.204	0.15	0.105	0.464
Left ventricular end systolic volume LVESV/ml	-0.063	0.659	0.087	0.542	-0.03	0.834
Left ventricular Ejection fraction (LVEF)%	-0.048	0.739	-0.044	0.76	0.155	0.278
Left ventricular fraction shorten (LVFS)%	0.004	0.98	-0.038	0.789	0.169	0.237
Left ventricular internal diameter in systole (LVIDs)/cm	-0.04	0.781	-0.051	0.723	-0.119	0.404
Left ventricular posterior wall in systole (LVPWs)/cm	0.065	0.648	0.103	0.471	-0.055	0.702
Aortic diameter(AOD)/cm	-0.061	0.671	-0.09	0.528	0.167	0.242
Left atrial diameter(LAD)/cm	-0.036	0.803	-0.167	0.242	-0.06	0.673
Aortic diameter /Left atrial diameter AO/LA %	0.131	0.361	-0.088	0.537	-0.222	0.117
Left ventricular mass (LVM) / g	-0.073	0.611	-0.015	0.92	-0.069	0.631

IV. Discussion

The echocardiographic parameters of Sudanese adult hypertension patients are compared to those of normal subjects in this study. Age, BMI, and gender all had an impact on the results. Hypertension's effects were divided into six categories, which include:

The effects of hypertension Duration on left ventricular dimensions:

The left ventricular dimensions of hypertensive patients are similar to normal limits based on normal subjects (Table 1) and standard reference ranges [7], but only the left ventricular mas diameter (LVMD) was considered large (p-value =0.000*) (Table 6) and it was associated with increased age for both normal participants and hypertensive patients (personal correlation (r) =0.352*, p-value =0.024) (Table 9) and (personal correlation (r) 0.323*respectively and body maximum index for hypertensive patients (personal correlation (r) =0.286*p-value =0.042) (Table 10) . In addition, there was a strong association between hypertensive duration with higher (systole/diastole) and Inter ventricular septum dimension in diastole (IVSD) (person correlation (r) 0.529 and P-value 0.000) (Table 11), but no significant correlation for other left ventricular dimensions and left ventricular internal diameter in diastole (LVIDd) was related to hypertension (p-value 0.004*). (Table 6). So the LVM can be associated to the duration of hypertension by increasing age and BMI, both of which affect blood pressure (systole/diastole). These findings are similar to those of a previous study (Schillaci, G et al – 2003), which found that weight loss as an initial strategy for controlling blood pressure was associated with increased left ventricular mass in overweight hypertensive individuals [8].

The effects of hypertension on left ventricular volumes:

Left ventricular volumes were larger in hypertensive patients when compared to normal participants (left ventricular end diastolic volume (LVEDV) and left ventricular systolic volume (LVESV) (P-value = 0.000 for both volumes) (Table 3 & Table 6) and were associated with age (person correlation (r) 0.529 and P-value 0.02) for hypertensive patients (Table 10) possibly due to left ventricular hypertrophy because half of the 51 hypertensive patients in this study had left ventricular (diastolic dysfunction) and cardiac ischemia (systolic dysfunction) as a result of their hypertension (Table 4).

The effect of hypertension on left ventricular ejection fraction:

Hypertensive patients' left ventricular ejection fraction was found to be less when compared to normal subjects (Table 5), but it is within the normal range of the standard reference [7] . Furthermore, there is a relationship between the ejection fractions of the two groups (normal participants and hypertensive patients) (p-value 0.000)(Table 6) and this happens when the muscle of the left ventricle is not pumping as well as normal. The ejection fraction is 40% or less so the amount of blood being pumped out of the heart is less than the body needs. A reduced ejection fraction can happen because the left ventricle is enlarged and cannot pump normally and High blood pressure is one of causes which Elevated pressure in arteries so the heart works harder to pump against increased pressure, which weakens the muscle [3]

The effect of hypertension on aortic and left atrial diameters had been studied

Thus the Aortic diameter is increased with age and its ratio with left atrium diameter with body max index for normal individuals (Table 9) but for hypertensive patients can be associated by its effect on blood pressure and this finding is similar to study done by (SMULYAN, Harold -2000) which revealed that The normal diastolic and elevated systolic pressures are largely due to age-related stiffening of the aorta. An in distensible aorta causes the pressure pulse to travel faster than normal, where it is quickly reflected off the peripheral resistance. The reflected wave then returns to the central aorta in systole rather than diastole. This augments the systolic pressure further, increasing cardiac work while reducing the diastolic pressure, on which coronary flow is dependent.[9]

The Association between Age and Body Max index on all echocardiographic parameters for normal participants and hypertensive patients :

There were no association of age and Body max index on all echocardiographic parameters for normal participants except Aortic diameter (AOD) , Aortic to left atrium diameters ratio (AOD/LAD) and Left ventricular mass diameter (LVMD) (personal correlation =0.288*,p-value =0.045), (personal correlation =0.398**,p-value =0.005) and (personal correlation =0.352* ,p-value =0.024) respectively (Table 9)but for hypertensive patients there were strongly relation of age with Left ventricular posterior wall in systole (LVPWd), Left ventricular end diastolic volume (LVEDV), Left ventricular Ejection fraction (LVEF) and Left ventricular internal diameter in systole (LVIDs) (p-values = 0.011,0.02, 0.033 and0.013) respectively (Table 10)but there were no significant association of Body max index with all echocardiographic parameters for both

groups except Aortic to left atrium diameters ratio (AOD/LAD)) for normal group (personal correlation =0.286* ,p-value =0.046) ((Table 9)

The study showed that there was no significant relation with gender for hypertensive patients and normal subjects except indexed ESV was significantly larger in males 47.6 33.4 versus females 30.9 15.7 (P-value = 0.021) for normal subjects as presented in table 8 and this differs from other previous studies [6,12] which might be due to differences in study locations and populations**.**

V. Conclusion

Increased left ventricular mass, left ventricular volumes, Aorta and left atrium diameters, and decreased left ventricular ejection fraction, were all been noticed in hypertensive echocardiographic parameters based on the comparison with normal individuals mean values. Left ventricular mass and End systolic volume were significantly larger in males versus females however fraction shortening, left ventricular posterior wall thickness in diastole and systole, and left ventricular end systolic volume were all increased with age for hypertensive patients.

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