International Journal of Biomedical And Advance Research

ISSN: 2229-3809 (Online)
Journal DOI:10.7439/ijbar
CODEN:IJBABN

Research Article

Echocardiographic Assessment of asymptomatic hypertensive patients

M. Hari Priya[1], K. Manas Chakravarthy[2] an D. Kishore Naik[3]

[1]*Department of Physiology, Akash institute of medical sciences and research center, Prasanahalli road, devanahalli, Banglaore-562110*
[2]*Department of Physiology, NRI Institute of Medical Sciences, NTR Health University, Visakhapatnam-531162, Andhrapradesh, India.*
[3]*Department of Anatomy, Akash institute of medical sciences and research center, Prasanahalli road, devanahalli, Bangalore-562110*

***Correspondence Info:**
M. Hari Priya,
D. No-4-3-785/2, Giripuram, Tirupathi, Andhrapradesh, India.
E-mail: haripriya980@gmail.com

Abstract

A study was done to assess Echocardiography of asymptomatic hypertensive patients. The present study is intended to identify subclinical abnormalities in LV function, LA dimension and Aortic root dimension among hypertensive subjects by using two dimensional (2D) standard echocardiography techniques. Apart from left ventricular mass and the corresponding geometry provides additional prognostic information about patients in hypertension. This finding is an agreement with several previous studies.

The present study identified three types of left ventricular geometry in the hypertensive patients. 1) Normal geometry, characterized by normal left ventricular mass index and normal relative wall thickness; 2) Concentric hypertrophy, characterized by increased left ventricular mass index and increased relative wall thickness and 3) Concentric remodeling, where the LV mass index is normal and the relative wall thickness is increased.

Keywords: Echocardiography, Left ventricular mass

1. Introduction

Hypertension is one of the most common worldwide disease afflicting humans because of the associated morbidity and mortality.[1] In the world, more than one in three adults suffer from Hypertension. There are at least 970 million people worldwide who have elevated blood pressure (hypertension) India is home to 139 million people of uncontrolled hypertension, which makes around 14 percent of the global population.[2,3] The average BP is about 80/60 mmHg at birth and rises slowly throughout childhood. It increases in the adolescence and is often in the region of 120/70 mmHg. A further increase in blood pressure for people in middle age 140/80 mmHg is common. Systolic B.P often continues to rise into old ages as the aorta becomes increasingly rigid.[4] Hypertension is a chronic medical condition in which the blood pressure in the arteries is elevated. It is a potent risk factor for heart failure.[5,6] The main mechanism of heart failure in patients with hypertension is a ventricular diastolic dysfunction.[7]Left ventricular diastolic dysfunction associated with hypertension is morphologically characterized by left - ventricular wall thickening and increased left atrial volume.[8,9]

Hypertension is classified as either primary or secondary hypertension. Primary hypertension has no specific origin ,but is strongly associated with lifestyle, it is responsible for 90 to 95% of diagnosed hypertension and is treated with stress management, changes in diet, increased physical activity and medication (if needed).Secondary hypertension is responsible for 5to10% of diagnosed cases of hypertension. It is caused by a preexisting medical condition such as congestive heart failure, liver failure or damage to the endocrine system.[10]

Echocardiography is a safe, sensitive & accurate tool for assessment of cardiac function in patients with hypertension .The determination of LV mass by echocardiography is a power predictor of cardiovascular risk .[11] Echocardiography provides a noninvasive means of assessing left ventricular function and evidence of LV wall remodeling in hypertensive person.[12] Echocardiography is not only the most versatile imaging technique for the cardiovascular system but also the most comprehensive and reliable hemodynamic tool. Therefore, hemodynamic variables such as pressure gradients, stenotic and regurgitate volume, left ventricular (LV) filling pressure are routinely and reliably measured with two-dimensional (2D) and Doppler echocardiography.[13]

The present study is intended to identify subclinical abnormalities in LV function, LA dimension and Aortic root dimension among hypertensive subjects by using two dimensional (2D) standard echocardiography techniques.

1.1 Aims and objectives

- To analyze LV mass, Geometric patterns through correlation of LV mass index, LV Ejection fraction (EF %) Relative wall thickness (RWT), Aortic root dimension and Fractional shortening (FS %) by using Two Dimensional Echocardiography (2D).
- To compare above parameters between male and female.

2. Materials and Methods

2.1 Data source

The present study was carried out in Echocardiography unit of SVIMS University, Tirupati. The study comprises of 50 subjects with hypertension. The report of the patients with hypertension who has undergone echocardiography examination during the period of Jan 2012 to march 2013.The subjects were selected based on Inclusion &Exclusion criteria.

2.2 Inclusion criteria: High normal, mild and moderate essential hypertension cases without any complication.

2.3 Exclusion criteria

- In the entire group individuals aged below 30 years and above 75 years were excluded.

- Subjects with diabetes mellitus
- Cerebrovascular diseases
- Renal diseases were excluded.

2.4 Experimental Design

- The physical examination were carried out by participants including measurement of Height , weight, body surface area (BSA), blood pressure (BP) and pulse rate (PR)
- BSA calculated by using Namogram chart
- Test was performed between 9 AM to 12 Noon

2.5 Materials

Weighing machine, **Inch tape**, **Sphygmomanometer,. Echo Gel, Echocardiogram Machine:**

Components:

There are five basic components of an ultrasound scanner that are required for generation, display and storage of ultrasound image

1. **Pulse generation:** Applies high amplitude voltage to energize the crystal
2. **Transducer:** Converts electrical energy to mechanical energy
3. **Receiver**: Detects and amplifies weak signal
4. **Display:** Displays ultrasound signals in a variety of modes
5. **Memory:** Stores video display

3. Results

Table: 01- Shows mean and SD values of age, height, weight and BSA among males and females

Parameters		Male	Female	P-Value
Age	Mean	54.55	61.42	0.47
	SD	12.89	9.38	
Height(cm)	Mean	163.95	160.58	0.16
	SD	6.90	7.68	
Weight(kg)	Mean	75.70	72.42	0.02
	SD	8.01	9.00	
BSA(m2)	Mean	1.82	1.76	0.02
	SD	0.11	0.13	

Table: 02- Shows mean and SD values of heart rate, SBP and DBP between male and females

Parameters		Male	Female	P-Value
Heart rate	Mean	83.65	82.33	0.78
	SD	9.06	9.05	
SBP	Mean	160.00	153.33	0.40
	SD	16.54	22.29	
DBP	Mean	84.00	89.17	0.47
	SD	8.83	6.69	

Table: 03 -Shows Mean and SD values of LA, Aorta, EF%, FS% between males and females

Parameters		Male	Female	P-value
LA (mm)	Mean	35.30	33.33	0.40
	SD	4.86	4.79	
Aorta(mm)	Mean	29.40	28.83	0.49
	SD	6.87	2.33	
EF (%)	Mean	60.20	60.08	0.55
	SD	8.63	3.96	
FS (%)	Mean	31.95	36.92	0.19
	SD	7.94	4.58	

Table: 04- Shows mean and SD values of LV Mass, LV Mass Index, RWT between Male and females

Parameters		Male	Female	P-value
LV Mass	Mean	175.85	173.00	0.77
	SD	58.26	39.26	
LV Mass Index	Mean	94.00	97.00	0.64
	SD	30.06	24.23	
RWT	Mean	0.42	0.45	0.23
	SD	0.14	0.11	

4. Discussion

Early detection of left ventricular hypertrophy (LVH) is a diagnostic, therapeutic and prognostic assessment of patients with essential hypertension. LVH is a strong predictor of many cardiovascular diseases. It is not only an important indicator of the severity of hypertension but also as a source of prognostic information about independent levels of blood pressure.[14] The occurrence of ventricular hypertrophy undoubtedly represents an important marker of increased risk for cardiovascular events. Therefore, the importance of identifying the patterns of hypertrophy in patients with hypertension is widely justified.[15,16] It is well known that hypertension results in cardiac overload .This overload is more profound on the LV where systolic high pressure is present. The cardiac muscle can tolerate this overload for a certain period of time; this depends on the severity and the period of the disease. In long term uncontrolled hypertension cardiac muscle changes are inevitable, these changes include hypertrophy or dilatation which depends on the severity of the disease.[17] Any provoked alterations involving either the anatomy or the functionality of the heart can easily be detected and imaged by echocardiography, which represents a real-time, quick, reproducible, cheap, and widespread method.[18]

In the present study, there was an increase in LV mass, LV mass index, SBP and HR in males when compared to females, but this increase was not statistically significant. DBP, RWT, and FS% was decreased in males when compared to females, but this decrease was not

statistically significant. Apart from left ventricular mass, the corresponding geometry provides additional prognostic information about patients in hypertension. This finding is an agreement with several previous studies.[19]

The present study identified three types of left ventricular geometry in the hypertensive patients

1) Normal geometry, characterized by normal left ventricular mass index and normal relative wall thickness
2) Concentric hypertrophy, characterized by increased left ventricular mass index and increased relative wall thickness and
3) Concentric remodeling, where the LV mass index is normal and the relative wall thickness is increased.

Table 1 indicates the values of Age, Height, Weight and BSA distribution. There was an increase in weight and BSA in males when compared to females and this increase was statistically significant.

Table 2 indicates the values of HR, SBP and DBP. There was an increase in HR and SBP in males when compared to females but this increase was not statistically significant. DBP was decreased in males when compared to females but this decreased was not statistically significant.

Table 3 indicates the values of LA, Aorta dimension, EF%, FS%. There was a small increase in LA size with increasing age, but it was not statistically significant. Similar findings were observed in **Nair B, Hughes J *et al*.**[20]
In our study shows that all the patients has Ejection fraction (EF %) within normal i.e. more than 50% among male and female. This indicates that the heart still has unimpaired systolic performance. Similar findings were observed in **Toumanidis *et al* and Ppadopouiou *et al*[21].**

Table 4 indicates the values of LV mass, LV mass index, RWT. LV mass was increased in males when compared to females but this increase was not statistically significant. RWT was decreased in males when compared to females and this decreased was not statistically significant.

Table: 5 Master Chart

S.NO	Name	Age	Sex	Height (cm)	Weight (kg)	BSA (m2)	HR	SBP	DBP	LA (mm)	Aorta (mm)	EF (%)	FS (%)	LVES (mm)	LVED (mm)	IVSD (mm)	PWD (mm)	LV mass (g)	LV MI (g/m^2)	Condi-Tion	RWT	Geome-Try
1	Maddilettamma	58	F	164	73	1.79	76	130	70	36	31	59	26	34	46	0.69	0.71	148	81	RR	0.43	CR
2	Subramanyam	48	M	156	70	1.7	80	130	80	37	29	65	44	27	49	0.61	0.81	142	81	RR	0.37	NG
3	Govindraju	74	F	173	71	1.84	90	170	90	45	29	51	27	35	48	0.66	0.76	148	80	RR	0.42	NG
4	Bhuvaneswari	38	F	156	50	1.47	80	160	70	26	32	52	42	28	40	0.66	0.75	101	69	RR	0.45	CR
5	Subbalakshmi	50	F	160	77	1.8	75	150	90	30	31	65	35	34	53	0.72	0.66	162	88	RR	0.3	NG
6	Munemma	66	F	154	64	1.62	76	160	80	31	30	65	42	28	49	0.69	0.66	142	86	RR	0.33	NG
7	Bhadramani	47	F	163	60	1.64	74	140	90	28	22	58	30	29	42	0.69	0.66	110	67	RR	0.43	CR
8	Premkumar	50	M	166	58	1.64	75	150	100	29	30	63	38	34	55	0.61	0.66	160	98	RR	0.29	NG
9	Jaffer hussan	45	M	165	78	1.85	100	170	90	37	28	43	20	45	56	0.80	0.80	165	87	RR	0.29	NG
10	Anasuyamma	56	F	170	67	1.78	82	160	80	36	25	56	43	32	46	0.64	0.90	138	77	RR	0.39	NG
11	Neelakanta reddy	64	M	173	75	1.89	80	140	80	35	52	60	32	35	52	0.83	0.75	181	96	RR	0.35	NG
12	khaja saheb	67	M	158	60	1.61	105	190	70	46	27	65	38	34	55	0.91	0.80	212	130	MA	0.28	CH
13	Gopalreddy	64	M	160	80	1.83	74	140	80	28	28	54	27	32	44	0.70	0.80	101	55	RR	0.36	NG
14	Subbareddy	59	M	172	75	1.88	76	160	90	35	31	70	42	31	54	0.80	0.70	143	75	RR	0.26	NG
15	Narasimhachari	60	M	164	88	1.94	75	170	100	33	30	66	37	33	53	0.60	0.75	187	94	RR	0.34	NG
16	Mohan	47	M	177	80	1.97	78	180	90	35	34	67	38	33	54	0.68	0.78	264	133	MOA	0.41	EH
17	Munirh begum	49	F	160	77	1.8	94	140	80	39	27	67	47	24	46	0.76	0.76	159	86	RR	0.43	CR
18	Anammachari	47	M	175	76	1.91	84	160	100	32	23	70	41	30	51	0.73	0.71	201	104	RR	0.39	NG
19	Syamala	58	F	155	66	1.65	80	170	90	29	26	58	38	30	49	0.60	0.76	164	97	MA	0.41	EH
20	Ramaiah nagaraj	61	M	156	70	1.7	83	130	80	32	30	70	42	28	49	0.81	0.75	153	88	RR	0.37	NG
21	Bhaltar vijaya	54	F	165	80	1.87	76	140	90	30	29	60	40	24	40	0.69	0.61	101	53	RR	0.4	NG
22	Rajakesavulu	48	F	164	71	1.77	80	190	90	35	30	63	43	23	41	0.82	0.76	205	114	RR	0.63	CR
23	Renukamma	51	F	160	75	1.78	84	170	80	32	30	60	37	28	45	0.69	0.76	143	78	RR	0.44	CR
24	Kamalamma	74	F	155	70	1.69	100	130	100	32	29	62	35	33	51	0.84	0.69	188	108	MA	0.35	EH
25	Syed basha	48	M	178	87	2.05	82	160	90	34	32	61	34	29	44	0.70	0.75	191	92	RR	0.55	CR
26	Krishniah	59	M	150	70	1.65	74	190	90	34	37	57	30	36	52	0.12	0.75	207	121	MA	0.35	EH
27	Kavithamma	56	F	172	96	2.09	80	140	100	33	28	64	40	33	55	0.75	0.83	199	93	RR	0.36	NG
28	Eswaramma	67	F	164	61	1.66	98	180	80	40	27	55	32	30	45	0.92	0.80	249	149	SA	0.46	EH
29	Venkataswamy	61	M	170	80	1.92	81	170	90	36	26	70	33	24	40	0.80	0.66	110	56	RR	0.4	NG
30	Arumugam pillai	58	M	165	85	1.92	90	140	80	38	32	44	26	34	46	0.80	0.60	138	70	RR	0.35	NG
31	Jayapal	49	M	160	70	1.73	82	170	90	32	22	62	34	30	46	0.69	0.61	128	72	RR	0.35	NG
32	Ayyalu	72	M	156	71	1.71	79	140	80	31	27	65	42	24	42	0.69	0.63	110	63	RR	0.38	NG
33	Challaswamy	72	M	170	74	1.85	81	170	70	37	24	57	31	32	47	0.69	0.65	132	71	RR	0.34	NG
34	Chenchaiah	52	M	160	65	1.68	104	180	80	34	30	55	33	30	45	0.68	0.69	123	72	RR	0.36	EH
35	Jayamma	52	F	164	75	1.82	73	130	90	33	32	63	35	34	53	0.76	0.72	187	101	MA	0.34	NG
36	Veeranarayana	33	M	162	76	1.81	78	150	90	42	29	44	18	43	53	0.77	0.65	138	75	RR	0.3	NG
37	Himachala naidu	53	M	170	65	1.75	77	170	80	40	33	60	21	45	55	0.75	0.76	170	97	RR	0.36	CH
38	Rajasekhar	67	M	155	66	1.65	81	180	80	30	24	70	38	24	39	0.83	0.64	201	120	MA	0.67	CH
39	Pulliah	63	M	160	85	1.88	104	190	100	38	38	62	42	26	45	0.66	0.80	305	157	SA	0.71	CH
40	Navanathamma	72	F	150	70	1.65	74	130	90	32	32	60	34	29	44	1.30	0.80	203	119	MOA	0.55	CH
41	Ghousebasha	42	M	166	75	1.83	75	140	90	34	25	70	40	28	47	0.72	0.80	238	128	MA	0.37	NG
42	Krishnammanaidu	76	M	171	88	2	81	170	100	41	25	60	36	32	50	0.81	0.86	142	69	RR	0.37	EH
43	Doraswamynaidu	33	M	165	90	1.97	80	160	80	28	36	59	33	36	54	0.72	0.78	235	116	MA	0.65	CR
44	Sarojamma	65	F	151	70	1.66	77	130	90	28	24	60	40	22	37	0.70	0.71	147	86	RR	0.65	CR
45	Sarfaina	47	M	153	75	1.73	83	160	70	30	22	70	26	25	34	0.66	0.60	122	68	RR	0.78	CR
46	Ramaiah	61	M	160	80	1.83	78	140	90	38	32	65	44	20	36	0.70	0.68	190	101	RR	0.65	CH
47	Narayanamma	62	F	170	64	1.74	85	180	90	41	29	65	22	31	40	0.75	0.68	187	107	MA	0.58	CH
48	Chittibabu	42	M	158	85	1.86	83	150	90	38	35	64	21	41	50	0.80	0.70	326	169	SA	0.38	NG
49	Manimegalai	45	F	156	61	1.6	80	130	80	34	30	60	31	32	47	0.76	0.65	153	95	RR	0.49	CH
50	Kanamma	60	F	156	60	1.55	98	190	100	40	33	65	32	35	52	0.81	0.72	267	181	SA	0.52	CH

5. Summary and Conclusion

Hypertensive patients aged between 30 to 75 years were selected for the study. Values were compared between males and females. Echocardiographic parameters of EF%, FS%, LA dimension, and Aortic root dimension were normal. In the present study, it was concluded that LV mass and LVMI was higher in males than females, but this increase was not statistically significant.

The present study indicates the altered diastolic function was more common in concentric hypertrophy group when we compared with concentric remodeling and normal geometry groups but it was not statistically significant. The role of echocardiography in LV mass determination is of great clinical value. LV mass and RWT was estimated by using 2D echo and Devereux modified formula, will allow to estimate LV mass with an acceptable level of accuracy. It improves the identification of LVH.

Echocardiography is widely available all over the world and major technical improvements have been achieved in the last two decades. Some information is still required to fully establish the role of echocardiography in evaluating hypertension.

References

1. Stassen JA, Wangi, Bianchi, Maatouv I,Wlld B, Herzogw. Essential hypertension. *Lancet*. 2003; 361:1629-641.
2. 2. Chaudary V. Hypertension becoming an Epidemic in India. *AMJ cardiol* 2013 Aprl 15; 16:41.
3. Maatouk I, Wild B, Herzog W. Longitudinal predictors of health-related quality of life in middle-aged and older adults with hypertension: results of a population-based study. *J Hypertens* 2012;30:1364-137.
4. Canlon C, Perry I.J. Epidemiology of Hypertension. In Crawford M.H and Dimarco J.P eds. Cardiology, London st Louis Mosby 2004 ;Sect:3
5. Levy D, Larson MG, Vasan RS. The progression from hypertension to congestive heart failure. *JAMA* 1996; 275:1557–1562.
6. Kannel WB, Castelli WP, McNamara PM. Role of blood pressure in the development of congestive heart failure. The Framingham study. *N Engl J Med* 1972; 287:781–787.
7. Gandhi SK, Powers JC, Nomeir AM. The pathogenesis of acute pulmonary edema associated with hypertension. *N Engl J Med* 2001; 344:17–22.
8. Kizer JR, Bella JN, Palmieri V. Left atrial diameter as an independent predictor of first clinical cardiovascular events in middle-aged and elderly adults: the Strong Heart Study (SHS), *Am Heart J* 2006;151:412–418.
9. Rossi A, Temporelli PL, Quintana M. Independent relationship of left atrial size and mortality in patients with heart failure: an individual patient meta-analysis of longitudinal data (Merge Heart Failure), *Eur J Heart Fail* 2009;11:929-936.
10. K Sembulingam: Essential of medical physiology, Ind JP, 2010; 5th ed .Sect:8 p. 580-583.
11. Froehlich ED, Apstein C, Chobanian AV, Deverux RB, Dustan HP, Dzaov, Faud-Tarazi .The heart in hypertension *Engl J Med* 1992; 327:998-1008.
12. Casale PN, Devereux RB, Milner, Zullo G, Harshfield GA, Pickering *et al*., Value of Echocardiographic measurement of left ventricle mass in predicting cardiovascular morbid events in Hypertension. *Ann intern Med* 1986 Aug; 105(2):173-8.
13. Jae K., James B, SEWARD A, Jamil T .The Echo MANUAL, Lippincott NY.2006 oct19; 3rd ed. p. 189
14. Bikina M, Evans JC, Larson MG, Benjamin EJ, Levy D. Left ventricular mass and risk of stroke in a elderly cohort: The Framingham Heart Study. *JAMA* 1994; 272:33-36.
15. Anderson KM, Savage DD. Echo cardiographically detected left ventricular hypertrophy: Prevalance and risk factors in the Framingham Heart Study. *Ann Intern Med* 1998; 108:7-13.
16. Post WS, Levy D. New Development epidemiology of left ventricular hypertrophy. The Framingham Heart study. *Massachusetts Curr Opin cardiol* 1994; 5:534-41.
17. Guyton AC, Hall JE: Text book of medical physiology, Philadriphia B-sounders 2000; 10th ed .96-109,229-332.
18. Garrison RJ, Kannel WB, Castelli WP. Prognostic implication of echo cardiographically determined left ventricular mass in the Framingham Heart study. *N Engl J Med* 1990; 322:1561-1566.
19. Verma A, Meris A, Skali H. Prognostic implication of left ventricular mass and geometry following myocardial infarctionin the valiant Echocardiographic study. *JACC Cardiovasc Imaging* 2008; 1:582-591.
20. Nair B, Hughes J, Basta M, Hardy D. Cardiovascular findingsin self reported healthy elderly. The Elite Seniors Study. *Aust NZ J Med* 1996; 26:363-7.
21. Toumanidis ST, Ppadopoulous ES, Saridakis NS, Kalantaridou AT, Nanas JN, Stamatelopoulos S *et al*., Evaluation of myocardial performance index to predict mild rejection in cardiac transplantation. *Clin Cardiol* 2004 Jun 27(6); 352-80.