THE STUDY OF CARDIAC ABNORMALITY IN GERIATRIC POPULATION OF RURAL CENTRAL INDIA

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ABSTRACT

BACKGROUND

Health care of elderly in the society has emerged as an increasingly important issue in the recent years. As the elderly proportion of our population expands, maintaining health and wellness of the aged will continue to be an important research priority in the near future. This study was undertaken to determine cardiac abnormalities in geriatric population by echocardiography in rural central India.

The aim of this study is to map the spectrum of cardiac abnormality in geriatric population of rural central India.

MATERIALS AND METHODS

The study was carried out on subjects from September 2014 – August 2016. All geriatric subjects i.e. above the age of 60 years who were admitted in medicine ward or who attended medicine OPD were considered for the study. All the preliminary biodata was collected, history taking and physical examination were done, ECG was recorded and finally 2D echo was performed in M-Mode, 2D echo, Doppler (CW and PW and TDI). All observations were recorded on a standard proforma sheet, statistical analysis was performed and results and conclusions drawn.

RESULTS

In present study, there was higher prevalence of major diseases. On M-Mode echocardiography, left atrial enlargement, LV hypertrophy/dilatation was found in significant number of subjects. On 2D echo, Myocardial Scarring/Thinning, valvular Degeneration was found significantly higher in elderly males, mitral and aortic calcification was found most frequently with prevalence higher in males. On Doppler echocardiography, diastolic dysfunction was common in elderly with very few subjects having normal diastolic function, most of the subjects having grade II diastolic dysfunction. Aortic, mitral and tricuspid regurgitation was common in elderly, and stenotic lesions of aortic and mitral valve were common.

CONCLUSION

We recommend that echocardiography should become an investigative norm in the elderly, this will aid in early detection of cardiovascular abnormalities, for which suitable therapeutic measures can be taken, that would ultimately decrease morbidity/mortality and make their life comfortable and dignified.

KEYWORDS

Elderly, Echocardiography, M-Mode, 2D Echo, Doppler.

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BACKGROUND

Most definitions of the elderly are based on chronological age. The World Health Organization uses 60 years of age as elderly.[1] Despite a decline in the rates of mortality due to heart disease in the past two decades, cardiovascular disease remains the most frequent single cause of death among persons over 65 years age.[2] With ageing of the myocardium, there is an increase in the size of myocytes and the rate of degenerative changes–lipid deposition, tubular dilatation, lipofuscin deposition, and a decrease in the mitochondrial oxidative phosphorylation.[3,4,5] Due to various age related changes, myocardial stiffness occurs, i.e. failure of myocardium to relax fully. This results in diastolic dysfunction, which may even progress to diastolic failure. The prevalence rate is about 3% of the normal population.[6] The ability to measure the cardiac dimensions and their cyclical changes has made echocardiography extremely useful tool in elderly.

Role of Echocardiography- M-mode echocardiographically determined left ventricular hypertrophy and increased left atrial dimension are independent predictors of mortality and morbidity from Coronary Heart Disease (CHD) and stroke.[7,8,9] Various parameters of left ventricular global and regional systolic function, which can be evaluated by two-dimensional echocardiography, such as decreased ejection fraction and

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abnormal segmental wall motion, are also associated with a higher incidence of cardiovascular morbidity and mortality.[10,11] Abnormalities of left ventricular diastolic function, such as filling indices evaluated by Doppler echocardiography, are known to be early indicators of myocardial ischaemia[12] and possibly preclinical (latent)[13] cardiovascular disease. In India, the average life expectancy has gone from 46.5 years in 1955 to 63 years in 2002.[14] India has become an ageing country with the population of the elderly crossing seventy million.[15] Despite the wide heterogeneity in the prevalence of cardiovascular risk factors across different regions, CVD has emerged as the leading cause of death in all parts of India, including poorer states and rural areas. The progression of the epidemic is characterised by the reversal of socioeconomic gradients; tobacco use and low fruit and vegetable intake have become more prevalent among those from lower socioeconomic backgrounds. In addition, individuals from lower socioeconomic backgrounds frequently do not receive optimal therapy, leading to poorer outcomes.[16] Hence, the health care of elderly in the society has emerged as an increasingly important issue in the recent years.

Study Design and Settings
This prospective cross-sectional study was carried out in the Department of Medicine, AVBRH, JNMC, Wardha.

Statistical Methods- Statistical analysis was done by using descriptive and inferential statistics using Chi-square test.

MATERIALS AND METHODS

Study Design and Settings- This prospective cross-sectional study was carried out in the Department of Medicine, Acharya Vinoba Bhave Rural Hospital of Jawaharlal Nehru Medical College, Wardha at central India. All the subjects who consented for the study who were 60 years of age and above, either through OPD or IPD in the Department of Medicine, were included randomly. The study was carried out on subjects from September 2014 – August 2016.

Exclusion Criteria- Sepsis, shock and comatose patients or Poor acoustic window on echocardiography.
Sample Size- 500 Cases Were Included For The Study.

Methods- Selected subjects were registered for the study randomly; biodata was recorded, and consent was taken. CVS clinical examination was carried out and finally echocardiographic examination was carried out. (Figure 1)

Study was done on Philips Echocardiography Machine, (HD 11 XE) with standard 2-4 MHz multi-frequency probe. Sector scan was performed to obtain 4 chamber, 2 chamber, parasternal long axis view, short axis view and subcostal view. M-Mode, 2D echo and Doppler (CW and PW AND TDI) assessment was carried out.

M-Mode- Assessment was done in PLAX view.

- Cursor is placed perpendicular to LV between mitral leaflet tip and papillary muscle and M-Mode display is generated.
- LVID in systole and diastole was measured.
- IVS and LWPW thickness was measured in diastole.
- LA size was also documented.
- Measurements were taken for assessment of chamber size and hypertrophy.

2D Echo

- It was carried out for assessment of valve structure and functioning, any abnormality such as degenerative change, prolapse, and restricted leaflet mobility was noted and recorded.
- Myocardium was observed in various views to assess myocardial thinning or scarring.
- Mitral and aortic valves observed for mobility, degenerative changes and calcification in 4 chamber, short axis, and 5 chamber view.

Doppler Study
For Stenosis /Regurgitation-

- Colour Doppler sample volume was placed across the valves and any significant regurgitation or stenosis was observed and documented (trivial regurgitation was ignored).
- Stenosis was confirmed by continuous Doppler interrogation.
- Observations were done in 4 chamber, 5 chamber, and short axis view.

For Diastolic Function Assessment

- Four chamber view was obtained and optimised.
- Pulse Doppler sample volume was placed at mitral leaflet tips and spectral display was generated.
- E wave and A wave velocity was measured.
- Tissue Doppler mode was then activated and Doppler sample volume placed at medial mitral annulus and spectral display was generated.
- E velocity was measured.
- E/E ratio was then calculated.

Ethics Committee Permission- The study was initiated after clearance from the institutional ethics committee, DMIMS (DU), Sawangi (M), Wardha.

Statistical Methods- Statistical analysis was done by using descriptive and inferential statistics using Chi-square test and software used in the analysis were SPSS 17.0 version and Graph Pad Prism 6.0 version and $p<0.05$ was considered as level of significance.

OBSERVATIONS AND RESULTS

In the present study, the age range was from 60 to 92 years in male subjects and from 60 to 90 in female subjects. Maximum number of subjects were in the age group 60 to 70 years in both males (43.8%) and females (35.2%). The

mean age was 67.44 ± 5.88 years and 67.01 ± 5.74 years in males and females respectively. The age distribution between the two groups (males and females) was statistically insignificant (p=0.78). (Table 1). Maximum number of subjects were clustered in the age group of 60 to 70 of which most of the patients had a history of HTN (32%) DM (24.2%), CAD (23.8%). There was no intergroup (between various age groups) variation in the frequency of different diseases, and the results were statistically insignificant (p>0.05). (Table 2).

In our study, it was also observed that the frequency of major diseases was more in males as compared to females, this difference was statistically significant. (Table 3).

In our study, clinically cardiomegaly was found in 113 (22.6%) subjects out of which 79 were male and 34 were female, the results were statistically significant (p=0.001). Heart sounds were abnormal in 149 (29.8%) subjects out of which 89 were male and 60 were female, the results were statistically insignificant. ECG was found to be abnormal in 162 (32.4%) patients, of which 113 (40.2%) were male and 49 (22.3%) female, the results were statistically significant (p=0.001). (Table 4).

In our study, left atrial enlargement was found to be present in 81 (16.2%) subjects of which 47 (16.7%) were male and 34 (15.5%) were female, the difference between male and female was statistically insignificant, but overall in the study population the results were statistically significant (p=0.0001). (Table 5).

Left Ventricular Myocardial Hypertrophy was found to be present in 195 (39%) subjects of which 136 (48.3%) were male and 59 (26.9%) were female, the results were statistically significant (p=0.0001). (Table 6).

Left Ventricular Chamber Dilatation was found in 71 (14.2%) subjects of which 42 (14.9%) were male and 29 (13.2%) were female. No statistically significant difference was found between them (males and females), but overall in the study population the results were statistically significant. (p=0.043). (Table 7).

In our study, Myocardial Scarring/Thinning was found in 50 (10%) subjects of which 39 (13.8%) were male and 11 (5.02%) were female, the results were statistically significant (p=0.001). Valvular Degeneration was found in 256 (51.2%) subjects of which 153 (54.4%) were male and 103 (47.03%) were female, this difference between gender was statistically insignificant. (Table 8).

Aortic Annular Calcification was found in 106 (21.2%) subjects of which 71 (25.2%) were male and 35 (15.9%) were female. Mitral annular calcification was found in 104 (20.8%) subjects of which 68 (24.19%) were male and 36 (16.4%) were female. The results were statistically significant (p=0.012 aortic, p=0.035 mitral). (Table 9).

In our study, out of the 79% subjects in 60 to 70 age group, 3.2% had a normal diastolic function, 21.8% had grade I diastolic dysfunction, 49.2% had grade II diastolic dysfunction and 4.8% had grade III diastolic dysfunction. In 71 to 80 years age group comprising of 19.4% subjects 1% had a normal diastolic function, 7% had grade I diastolic dysfunction, 10% had grade II diastolic dysfunction, and 1.4% had grade III diastolic dysfunction. In the age group of >80 years having 1.6% of the total subjects, none had a normal diastolic function, 1.2% had grade I diastolic dysfunction, and grade II and III comprised of 0.2% each. The results were statistically significant (p=0.042). (Table 10).

Also, out of the 281 (56.2%) males, 18 (6.4%) had a normal diastolic function, 119 (42.3%) had grade I diastolic dysfunction, 124 (44.1%) had grade II diastolic dysfunction and 20 (7.1%) had grade III diastolic dysfunction. In the female group out of the 219 (43.8%) subjects, 2 (0.9%) had a normal diastolic function, 31 (14.15%) had grade I diastolic dysfunction, 174 (79.4%) had grade II, and 12 (5.4%) had grade III diastolic dysfunction. The results were statistically significant (p=0.0001). (Table 11).

In our study, aortic regurgitation was found to be present in 26.8%, mitral regurgitation in 21.8%, tricuspid regurgitation in 24.4% and pulmonary regurgitation in 0.4%. (Table 12).

Aortic stenosis was found to be present in 36.2%, mitral stenosis in 31%, tricuspid stenosis in 2.4% and pulmonary stenosis in 0.00%. (Table 13).

Age Group (yrs.)	**Male (n=281)**	**Female (n=219)**	**א 2- value**
60-70 yrs.	219 (43.8%)	176 (35.2%)	0.48 p=0. 78, NS
71-80 yrs.	57 (11.4%)	40 (8%)	
>80 yrs.	5 (1%)	3 (0.6%)	
Total	**281 (56.2%)**	**219 (43.8%)**	
Mean Age ± SD	67.44 ± 5.88 (60-92 yrs.)	67.01 ± 5.74 (60-90 yrs.)	

Table 1. Age Wise Distribution of Patients

Diseases	**60-70 yrs. n = 395**	**71-80 yrs. n = 97**	**>80 yrs. n =8**	**א2-value**	**p-value**
DM	121 (24.2%)	26 (5.2%)	4 (0.8%)	2.05	0.35, NS
HTN	160 (32%)	35 (7%)	3 (0.6%)	0.62	0.72, NS
HF	79 (15.8%)	17 (3.4%)	2 (0.4%)	0.45	0.79, NS
CAD	119 (23.8%)	31 (6.2%)	2 (0.4%)	0.23	0.88, NS
COPD	100 (20%)	26 (5.2%)	2 (0.4%)	0.09	0.95, NS

Table 2. Major Diseases according to Age in Years

Diseases	Male n = 281	Female n = 219	א2- value	p-value
DM	89 (17.8%)	62 (12.4%)	0.66	0.41, NS
HTN	132 (26.4%)	66 (13.2%)	14.58	0.0001, S
HF	72 (14.4%)	26 (5.2%)	14.76	0.0001, S
CAD	106 (21.2%)	46 (9.2%)	16.25	0.0001, S
COPD	132 (26.4%)	66 (13.2%)	14.58	0.0001, S

Table 3. Major Diseases according to Gender

	Normal		Abnormal		p-value
	Male	Female	Male	Female	
Cardiomegaly	202 (40.4%)	185 (37%)	79 (15.8%)	34 (6.8%)	11.15 P=0. 001, S
Heart Sounds	192 (38.4%)	159 (31.8%)	89 (17.8%)	60 (12%)	1.07 P=0. 30, NS
ECG	168 (33.6%)	170 (34%)	113 (22.6%)	49 (9.8%)	17.88 P=0. 0001, s

Table 4. Clinical Findings and ECG

	Left Atrium		p-value
	Dilated	Normal	
Male (n = 281)	47 (9.4%)	234 (46.8%)	0.13
Female (n = 219)	34 (6.8%)	185 (37%)	p=0. 71, NS
Total	**81 (16.2%)**	**419 (83.8%)**	**92.48 p=0. 0001, S**

Table 5. Left Atrial Enlargement

	Present	Absent	א2-value
Male (n=281)	136 (27.2%)	145 (29%)	23.82 p=0. 0001, S
Female (n=219)	59 (11.8%)	160 (32%)	
Total	**195 (39%)**	**305 (61%)**	

Table 6. Left Ventricular Myocardial Hypertrophy (IVS/PW>11 mm)

	Present	Absent	א2-value
Male (n=281)	42 (8.4%)	239 (47.8%)	0.29 p=0. 58, NS
Female (n=219)	29 (5.8%)	190 (38%)	
Total	**71 (14.2%)**	**429 (85.8%)**	**3.55 p=0. 043, S**

Table 7. Left Ventricular Chamber Dilatation

(LVIDs>40 mm or LVIDd>50 mm)

	Present		Absent		p-value
	Male	Female	Male	Female	
Myocardial Scarring/Thinning	39 (7.8%)	11 (2.2%)	242 (48.4%)	208 (41.6%)	10.72 p=0. 001, S
Valvular Degeneration	153 (30.6%)	103 (20.6%)	128 (25.6%)	118 (23.6%)	2.70 p=0. 100, NS

Table 8. 2D ECHO for Structural Abnormality

Annular Calcification	Present		Absent		p-value
	Male	Female	Male	Female	
Aortic	71 (14.2%)	35 (7%)	210 (42%)	181 (36.2%)	6.35 p=0. 012, S
Mitral	68 (13.6%)	36 (7.2%)	213 (42.6%)	183 (36.6%)	4.50 p=0. 035, S

Table 9. Annular Calcification

	60-70 yrs. (n=395)	71-80 yrs. (n=97)	>80 yrs. (n=8)	א2-value	p-value
Normal	16 (3.2%)	5 (1%)	0 (0%)	13.07	0.042, S
Grade I Diastolic Dysfunction	109 (21.8%)	35 (7%)	6 (1.2%)		
Grade II Diastolic Dysfunction	246 (49.2%)	50 (10%)	1 (0.2%)		
Grade III Diastolic Dysfunction	24 (4.8%)	7 (1.4%)	1 (0.2%)		
Total	**395 (79%)**	**97 (19.4%)**	**8 (1.6%)**		

Table 10. Diastolic Dysfunction According to Age in Years

	Male (n=281)	Female (n=219)	א2-value	p-value
Normal	18 (3.6%)	2 (0.4%)	68.17	0.0001, S
Grade I Diastolic Dysfunction	119 (23.8%)	31 (6.2%)		
Grade II Diastolic Dysfunction	124 (24.8%)	174 (34.8%)		
Grade III Diastolic Dysfunction	20 (4%)	12 (2.4%)		
Total	**281 (56.2%)**	**219 (43.8%)**		

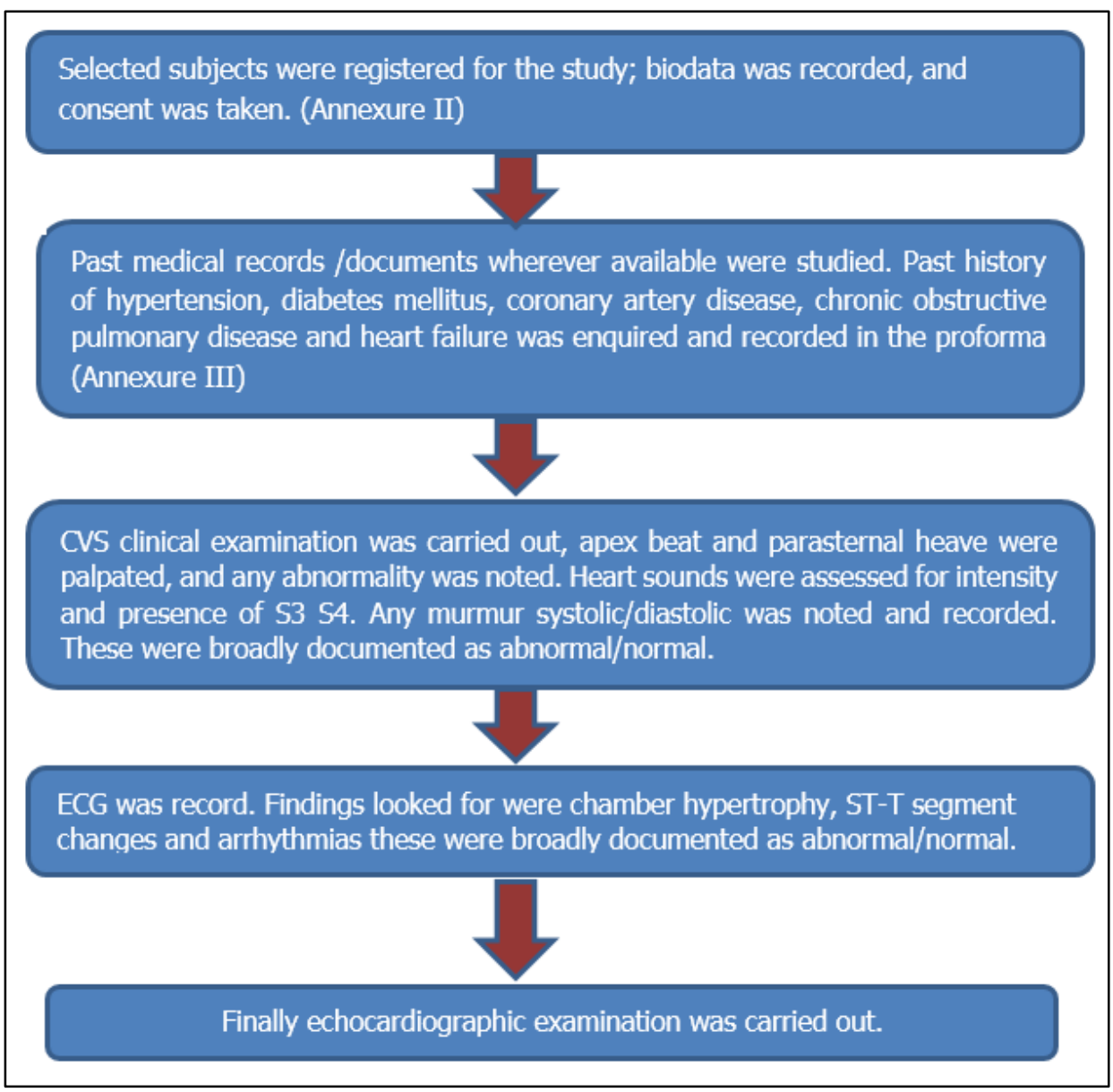
Table 11. Diastolic Dysfunction According to Gender

Regurgitation	Present	Absent	Total
Aortic	134 (26.8%)	366 (73.2%)	500 (100%)
Mitral	109 (21.8%)	391 (78.2%)	500 (100%)
Tricuspid	122 (24.4%)	378 (75.6%)	500 (100%)
Pulmonary	2 (0.4%)	498 (99.6%)	500 (100%)

Table 12. Valvular Regurgitation

Regurgitation	Present	Absent	Total
Aortic	181 (36.2%)	319 (63.8%)	500 (100%)
Mitral	155 (31%)	345 (69%)	500 (100%)
Tricuspid	12 (2.4%)	488 (97.6%)	500 (100%)
Pulmonary	0 (0.0%)	500 (100%)	500 (100%)

Table 13. Valvular Stenosis



Flow Chart

DISCUSSION

The study was conducted for identification of geriatric subjects, who show significant structural and functional cardiac abnormalities on echocardiography and to advise suitable measures for preventing morbidity and mortality in such subjects in the form of lifestyle modification/optimising medical treatment.

Age and Gender- The age distribution between the two groups (males and females) was statistically insignificant (p = 0.78). This means that subjects included in the study were age matched. Similarly, Bikkina et al,[17] Gupta MS et al and Chang et al[18] in their study had mean age corresponding to the present study.

Major Diseases- There was no intergroup (various age groups) variation in the frequency of different diseases, and the results were statistically insignificant (p>0.05). In the present study, it was also observed that the frequency of major diseases was more in males as compared to females, this difference was statistically significant. Gupta Hl et al conducted a study in asymptomatic aged individuals (>or = 60 years) in The National Capital Territory of Delhi for the prevalence of major health problems like hypertension, diabetes mellitus and respiratory diseases. A total of 200 individuals (100 males and 100 females) were studied over a period of three months in 1998-99. The Prevalence of hypertension, diabetes mellitus, COPD was 32.5%, 13%, 10% (more in males) respectively.[19] Raman Kutty V et al, found an overall prevalence of type 2 diabetes is 16.3%. Gender differences in prevalence were negligible.[20] Similar observations were found in the present study. Heidi M et al in their study found the prevalence of CAD to be 22% of women and 33% of men aged 65 to 70 years and 43% of women and 45% of men older than 85 years. By 80 years of age, the frequency of symptomatic CHD is about 20% to 30% in both men and women.[21]

CVS Clinical Examination and ECG- In the present study, clinically cardiomegaly was found in 113 (22.6%) subjects. Heart sounds were abnormal in 149 (29.8%) patients out of which 89 were male and 60 female, the results were statistically insignificant. ECG was found to be abnormal in 162 (32.4%) patients.

Similarly, Dev DK et al, in their study found the prevalence of systolic murmur to be 31% (females 36.4%, males 23.9%).[22]

In the present study, it was observed that heart sounds were abnormal more in males as compared to females, this was probably due to the larger sample size of males.

Mittelmark MB et al in his publication showed that the Evaluation of ECGs, CHS participants had similar results.[23]

Gupta Hl et al in his study found that a large percentage of the study group (34.4%) had asymptomatic ECG abnormalities.[18] These results were similar to the observations of the present study.

M-Mode- In the present study, Left Atrial Enlargement was found to be present in 81 (16.2%) subjects. Pearson AC et al,[24] Gupta MS et al, Bofill VP et al had similar findings in their study.

In the present study, Left Ventricular Myocardial Hypertrophy was found to be present in 195 (39%) subjects, the results were statistically significant (p=0.0001).

Similarly, Chang SM et al in their study found LVH in 52% of elderly subjects.[18]

Gupta MS et al found that the left ventricular (a) wall dimensions especially in diastole (IVS and LVPW) reduced with age, but it was statistically insignificant (p value NS). Aurigemma GP et al in his study found LVH to be present in 31.9% of healthy elderly subjects.[25] Pearson AC et al in their study found the prevalence of left ventricular hypertrophy to be 26%.[24] In the present study, the prevalence of HTN was 39.6%, which is almost similar to the evidence of LVH on echocardiography. Pearson AC et al[24] also found a similar correlation between LVH and HTN. Gerstenblith G et al also found in his study that increased age is associated with increased diastolic wall thickness.[26]

In the present study, Left Ventricular Chamber Dilatation was found in 71 (14.2%) subjects. No statistically significant difference was found between them (males and females), but overall in the study population the results were statistically significant. (p=0.043). Similarly, Chang SM et al in their study found left ventricular dilatation to be present in 22% of the subjects.[18]

2D Echo- In the present study, Myocardial Scarring/Thinning was found in 50 (10%).

Valvular Degeneration was found in 256 (51.2%) subjects.

In the present study, Aortic Annular Calcification was found in 106 (21.2%) subjects. Mitral annular calcification was found in 104 (20.8%) subjects.

Similarly, Gupta MS et al had similar results, but Chang SM et al in their study found the incidence of MAC and aortic calcification/sclerosis to be 43% and 47% respectively. They concluded that both mitral annulus calcification and aortic sclerosis were indeed associated with higher prevalence of myocardial perfusion abnormality and angiographic CAD.[18] Studies of Lindroos M et al,[27] Yazdanyar A et al,[28] and Stewart BF[29] had similar results as in the present study.

Doppler (CW, PW and TDI)- In the present study, 60 - 70 years age group constituted 79% of the total subjects studied, of which 3.2% had a normal diastolic function, 21.8% had grade I diastolic dysfunction, 49.2% had grade II diastolic dysfunction and 4.8% had grade III diastolic dysfunction. In 71 to 80 age group comprising of 19.4% subjects, 1% had a normal diastolic function, 7% had grade I diastolic dysfunction, 10% had grade II diastolic dysfunction, and 1.4% had grade III diastolic dysfunction. In the age group of >80 years having 1.6% of the total subjects, none had a normal diastolic function, 1.2% had grade I diastolic dysfunction, and grade II and III comprised

of 0.2% each. The results were statistically significant (p=0.042).

Also, out of the 281 (56.2%) males, 18 had a normal diastolic function, 119 had grade I diastolic dysfunction, 124 had grade II diastolic dysfunction and 20 had grade III diastolic dysfunction. In the female group out of the 219 (43.8%) subjects, 2 had a normal diastolic function, 31 had grade I diastolic dysfunction, 174 had grade II, and 12 had grade III diastolic dysfunction. The results were statistically significant (p=0.0001).

Similarly, studies of Heidi M et al, Klein AL et al,[30] Tsang TS et al,[31] Gupta MS et al, Sytkowsky et al[32] had results which were consistent with the present study.

In the present study, aortic regurgitation was found to be present in 26.8%, mitral regurgitation in 21.8%, tricuspid regurgitation in 24.4% and pulmonary regurgitation in 0.4%.

Similarly, Singh JP et al in the Framingham Heart Study[33] and Nkomo VT et al[34] had similar results.

In the present study, aortic stenosis was found to be present in 36.2%, mitral stenosis in 31%, tricuspid stenosis in 2.4% and pulmonary stenosis in 0.00%.

Rezzoug N et al in their study found the prevalence to be less than the present study.[35]

Higher prevalence of valvular stenosis was found in the present study. This can be attributed to the inclusion of even mild valvular lesions as significant in the observation.

CONCLUSION

Geriatric population differs from other groups of population and poses specific health challenges. The challenges are morbidity due to decreased reserve functions of various organs, degeneration across various systems and decreased immune function.

As a health professional, it is imperative that one should be vigilant about such changes and should use all possible means; clinical and investigative to detect problems in the geriatric age group at the earliest. This goes a long way in instituting therapeutic measures to make the life of this group comfortable and dignified. As the elderly proportion of our population expands, maintaining health and wellness of the aged will continue to be an important research priority in the near future. Cardiovascular structural and functional disturbances constitute a major source of morbidity/mortality in the geriatric population. Our study, was one such endeavour directed towards abovementioned goal. This study underscores the importance of early diagnosis and early institution of optimal therapeutic measures to prevent cardiovascular morbidity.

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REFERENCES

[1] Zipes. Pathophysiology of aging. In: Mann DL, Zipes DP, Libby P, et al, eds. Braunwald's heart disease: a textbook of cardiovascular medicine. 7th edn. Elsevier Health Sciences 2014:1925-1946, 187-210, 457-507, 653, 1491-1492.

[2] Wei JY. Age and the cardiovascular system. New England Journal of Medicine 1992;327(24):1735-1739.

[3] Koobs DH, Schultz RL, Jutzy RV. The origin of lipofuscin and possible consequences to the myocardium. Arch Pathol Lab Med 1978;102(2):66-68.

[4] Bandy B, Davison AJ. Mitochondrial mutations may increase oxidative stress: implications for carcinogenesis and aging? Free Radic Biol Med 1990;8(6):523-539.

[5] Coral-Debrinski M, Stepien G, Shoffner JM, et al. Hypoxemia is associated with mitochondrial DNA damage and gene induction: implications for cardiac disease. JAMA 1991;266(13):1812-1816.

[6] Gandhavalla VM, Athikari CS, Venkatachalam M, et al. A study of myocardial function by echocardiography in elderly subjects. Int J Physiother Res 2014;2(3):561-566.

[7] Levy D, Garrison RJ, Savage DD, et al. Prognostic implications of echocardiographically determined left ventricular mass in the Framingham heart study. N Eng J Med 1990;322(22):1561-1566.

[8] Levy D, Garrison RJ, Savage DD, et al. Left ventricular mass and incidence of coronary heart disease in an elderly cohort. The Framingham heart study. Ann Intern Med 1989;110(2):101-107.

[9] Benjamin EJ, Levy D, Plehn JF, et al. Left atrial size: an independent risk factor for stroke. The Framingham study. Circulation 1989;80(Suppl II):615.

[10] Taylor GJ, Humphries JO, Mellits ED, et al. Predictors of clinical course, coronary anatomy and left ventricular function after recovery from acute myocardial infarction. Circulation 1980;62(5):960-970.

[11] Ong L, Green S, Reiser P, et al. Early prediction of mortality in patients with acute myocardial infarction: a prospective study of clinical and radionuclide risk factors. Am J Cardiol 1986;57(1):33-38.

[12] Labovitz AJ, Lewen MK, Kern M, et al. Evaluation of left ventricular systolic and diastolic dysfunction during transient myocardial ischemia produced by angioplasty. J Am Coll Cardiol 1987;10(4):748-755.

[13] Julius S, Jamerson K, Mejia A, et al. The association of borderline hypertension with target organ changes and higher coronary risk. Tecumseh blood pressure study. JAMA 1990;264(3):354-358.

[14] Park K, Life expectancy, preventive and social medicine. 18th edn. Jabalpur: Banarsi Das Bhanot 2005: p. 355.

[15] Gupta M, Anand J, Singh H, et al. Echocardiographic assessment of a healthy geriatric population. J Indian Acad Clin Med 2004;5(1):47-51.

[16] Prabhakaran D, Jeemon P, Roy A. Cardiovascular diseases in India: current epidemiology and future directions. Circulation 2016;133(16):1605-1620.

[17] Bikkina M, Levy D, Evans JC, et al. Left ventricular mass and risk of stroke in an elderly cohort. The Framingham heart study. JAMA 1994;272(1):33-36.

[18] Chang SM, Hakeem A, Nagueh SF. Predicting clinically unrecognized coronary artery disease: use of two-dimensional echocardiography. Cardiovasc Ultrasound 2009;7(1):10.
[19] Gupta HL, Yadav M, Sundarka MK, et al. A study of prevalence of health problems in asymptomatic elderly individuals in Delhi. J Assoc Physicians India 2002;50:792-795.
[20] Raman Kutty V, Joseph A, Soman CR. High prevalence of type 2 diabetes in an urban settlement in Kerala, India. Ethn Health 1999;4(4):231-239.
[21] Mann DL, Zipes DP, Libby P, et al. Braunwald's heart disease: a textbook of cardiovascular medicine. Elsevier Health Sciences 2014:200-277, 1-200.
[22] Dey DK, Sundh V, Steen B. Do systolic murmurs predict mortality in the elderly? A 15-year longitudinal population study of 70-year-olds. Arch Gerontol Geriatr 2004;38(2):191-200.
[23] Mittelmark MB, Psaty BM, Rautaharju PM, et al. Prevalence of cardiovascular diseases among older adults. The cardiovascular health study. Am J Epidemiol 1993;137(3):311-317.
[24] Pearson AC, Gudipati C, Nagelhout D, et al. Echocardiographic evaluation of cardiac structure and function in elderly subjects with isolated systolic hypertension. J Am Coll Cardiol 1991;17(2):422-430.
[25] Aurigemma GP, Gottdiener JS, Shemanski L, et al. Predictive value of systolic and diastolic function for incident congestive heart failure in the elderly: the cardiovascular health study. J Am Coll Cardiol 2001;37(4):1042-1048.
[26] Gerstenblith G, Frederiksen JA, Yin FC, et al. Echocardiographic assessment of a normal adult aging population. Circulation 1977;56(2):273-278.
[27] Lindroos M, Kupari M, Heikkilä J, et al. Prevalence of aortic valve abnormalities in the elderly: an echocardiographic study of a random population sample. J Am Coll Cardiol 1993;21(5):1220-1225.
[28] Yazdanyar A, Newman AB. The burden of cardiovascular disease in the elderly: morbidity, mortality, and costs. Clin Geriatr Med 2009;25(4):563-577.
[29] Stewart BF, Siscovick D, Lind BK, et al. Clinical factors associated with calcific aortic valve disease. Cardiovascular health study. J Am Coll Cardiol 1997;29(3):630-634.
[30] Klein AL, Burstow DJ, Tajik AJ, et al. Effects of age on left ventricular dimensions and filling dynamics in 117 normal persons. Mayo Clin Proc 1994;69(3):212-224.
[31] Tsang TS, Gersh BJ, Appleton CP, et al. Left ventricular diastolic dysfunction as a predictor of the first diagnosed nonvalvular atrial fibrillation in 840 elderly men and women. J Am Coll Cardiol 2002;40(9):1636-1644.
[32] Sytkowski PA, Kannel WB, D'Agostino RB. Changes in risk factors and the decline in mortality from cardiovascular disease. The Framingham heart study. N Eng J Med 1990;322(23):1635-1641.
[33] Singh JP, Evans JC, Levy D, et al. Prevalence and clinical determinants of mitral, tricuspid, and aortic regurgitation (the Framingham heart study). Am J Cardiol 1999;83(6):897-902.
[34] Nkomo VT, Gardin JM, Skelton TN, et al. Burden of valvular heart diseases: a population-based study. Lancet 2006;368(9540):1005-1011.
[35] Rezzoug N, Vaes B, de Meester C, et al. The clinical impact of valvular heart disease in a population-based cohort of subjects aged 80 and older. BMC Cardiovasc Disord 2016;16(1):7.