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Pattern of cardiovascular diseases among elderly patients admitted in medical wards in tertiary care teaching hospital in western India

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Abstract
Background: Cardiovascular disease is the most frequent cause of death in persons over the age 50 years and most importantly it is responsible for considerable morbidity and large burden of disability in the community. Cardiovascular diseases are an increasing cause of admissions among elderly in India, yet little research is available on pattern and magnitude of the problem.
Objective: To determine the pattern of cardiovascular disease in elderly patients admitted in medical wards at tertiary care teaching hospital in western India.
Methodology: This was a descriptive cross sectional study that was carried our between October 2016 and October 2017. Social demographic information; medical history physical examination; electrocardiographic and echocardiography examination; biochemical and haematological parameters were collected from study patients.
Results: One hundred eighty five (185) elderly patients admitted and were enrolled into the study. Majority, 116 (62.7%), were male. Their mean age was 66.1 (SD, 9.3; range, 50 87) years. The mean body mass index (BMI) was 23.9 (SD, 3.9; range, 16.6 - 40.1) kg/m2. Hypertension was the most frequent condition encountered affecting both males (67.2%) and females (68.1%). Congestive heart failure was second common condition affecting 37% elderly patients. According to the echocardiogram findings, among 185 elderly patients 68.6% were diagnosed to have cardiovascular disease. There were no significant sex differences in the prevalence of cardiac disease (p>005). The commonest echocardiographic diagnosis were left ventricular hypertrophy (LVH) secondary to hypertension found in 45%, diastolic dysfunction found in 31% and systolic dysfunction 25%.The least common types were septal defect, pulmonary hypertension and calcified mitral valve found in one per cent each. The commonest clinical presentations were palpitations, dyspnoea, orthopnoea, pedal oedema and right upper quadrant abdominal pain. Obese patients presenting with cardiovascular abnormalities were 9 (7.1%). Anaemia was the leading co-morbidity affecting 90.3% of the patients.
Conclusion: Hypertension, congestive heart failure and left ventricular hypertrophy were the commonest cardiovascular diseases among elderly patients. Coexistence of anaemia, stroke, renal impairment and diabetes was also frequent.

Keywords: cardiovascular disease, elderly, patterns, wards

Introduction

Cardiovascular diseases are the dominant worldwide cause of morbidity and mortality worldwide and with current lifestyle, are likely to increase in future as well. In 2008, cardiovascular deaths represented 30% of all global deaths, with more than 80% of this deaths are taken place in developing countries [1]. Acute Coronary Syndrome (ACS) entitled as a Global non communicable epidemic. In India, there are approximately 64 million patients suffering from Coronary Artery Disease (CAD) in 2015, which is more than double as compared to 2005 data, and the number of patient will further amplify in upcoming years; as per National Commission on Macroeconomics and Health [2].

Coronary Artery disease (CAD) in Indians has been found to be more serious and allied with more severe complications which were also associated with increase in mortality at younger age. CAD is affecting Indians community 5-10 years before than other communities. As compared to other racial groups, Indians show higher number of hospitalisation, morbidity, and mortality [3, 4].

CVD is a major cause of chronic illness and disability in most of the countries. Is now it accounting for 11% of total deaths, which is the second most common cause of death after infectious diseases [5]. Aging is the most prevailing risk factor for CVD that's why mostly affecting individuals are of older age group [6] and are frequently diagnosis in elderly people older than 65 years of age [7]. There are also increase in incidence of hypertension, atherosclerosis, stroke, left ventricular hypertrophy, chronic heart failure and atrial fibrillation which has been secondary to age related changes in cardiovascular structure and functions [8].

In the United States of America (USA), the prediction of CVD for people aged 65 years or older signify that the proportion will escalate from 12.4% in the year 2000 to 19.6% in 2030 [9]. In the developed countries, it demonstrate that men and women experience CVD events at an older age and die at a later age as compared to developing countries [10].

It was proven that death due to CVD has no significant gender

difference [11], but studies have mentioned that CVD was mainly the disease of men with high prevalence, incidence, and mortality rates; as compared with women [12, 13]. But women experience earliest episode of cardiovascular disease later in life than men as stated in some studies [14].

Cardiovascular diseases (CVDs) are showing an escalation among the Indian population with a trend of reaching the younger age groups. It is now known to have a major share in the burden of diseases. A number of studies have been conducted time and again to find out the prevalence of CVDs and it has been found that they have a widespread prevalence in India, with regional variations. It is now affecting almost all sections of the society from young to old [15].

Materials and methods

The study was conducted in medical wards of hospital, from October 2016 to October 2017**.** Study subjects were all consenting patients aged fifty years and above admitted in medical wards with cardinal symptoms of cardiovascular disease which are chest pain, dyspnoea, palpitation, fatigue and syncope.

Inclusion Criteria

- Elderly age above fifty years admitted
- Elderly patients who consented to participate in the study

Exclusion Criteria

Elderly who did not consent to the study

Elderly patients admitted every day during the study period were identified, informed about the aim of the study and asked to participate. A structured questionnaire was used to collect data from all consented patients. History, physical examination, electrocardiography, echocardiography, biochemical and haematological data were collected from study patients. A detailed history of cardiovascular system was taken looking for the presence of palpitation, dyspnoea, orthopnoea, paroxysmal nocturnal dyspnoea, cough, chest pain, ankle oedema, abdominal pain and syncope. A cardiovascular examination as well as examination of other systems was done to all of the study patients.

Blood pressure was measured using a standard mercury sphygmomanometer with an appropriate cuff size. Three sitting BP measurements were taken from the arm of each subject after a 5 min rest and with a two-minute interval between them. Average systolic and diastolic BP readings were calculated for each subject.

Weight and height were measured in all studied patients. BMI (kg/m^2) was computed using weight (in kilogram) divided by height (in meters squared).

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2\,(\text{m}^2)}$$

From each patient 10 ml of venous blood was collected and sent to the hospital's central laboratory for the analysis of haemoglobin levels, total serum cholesterol, random blood sugar, creatinine, and serum electrolytes.

Echocardiogram Evaluation

Echocardiographic evaluation was done to all enrolled patients by principal investigator assisted by experienced cardiologist using a GE, Vivid e TWADP100 Echocardiography machine with a 2.5.0MHz transducer. Echocardiographic images of all patients were recorded on Video tapes. Standard views and measurement were acquired. M-mode, 2D and Doppler studies were used to assess structural and functional cardiac abnormalities of valves, myocardium pericardium and chamber sizes. Cardiac ejection fractions were calculated automatically by an echocardiograph machine in all patients. Patients with ejection fraction less than 50% were classified as having systolic dysfunction. Diastolic function was assessed using Doppler studies of mitral inflow and annular velocities (E, A and E' velocities) as well as deceleration time.

ECG

Standard Twelve leads electrocardiography was done to all patients using a BPL ECG model CARDIART 6208 view. Interpretation was done by the investigator with assistance of experienced cardiologist.

Definitions used in the study

Patients with cardiovascular disease included those presenting with symptoms and signs mentioned above. Some of the cardiovascular conditions were defined as:

- **Hypertension** was defined according to criteria of the Eight Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC VIII)Based on the level of BP, the patients are divided into two groups as follows:

Systolic BP: <150 mm Hg
Diastolic BP: <90 mm Hg Age ≥ 60 years of JNC 8 report

Systolic BP: <140 mm Hg
Diastolic BP: <90 mm Hg Age ≤ 60 years of JNC 8 report [16]

- **Heart failure** is defined as a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood [17].
- **Diastolic dysfunction** was defined by Doppler E/A<1, DT>240, or E/E'>15 [18, 19].
- **Left ventricular hypertrophy** was defined as an increase in the mass of the left ventricle.
  - In males the LV mass of more than 135 g or the mass index >71 g/m2 [18, 19].
  - -In women the values greater than 99 g and 62 g/m2 [18, 19].
- **Dilated cardiomyopathy** was diagnosed in patients with dilated left ventricular cavities (LV diastolic diameters > 5.9cm in males and 5.3cm in women, associated with decreased global systolic function (ejection fraction < 50%) [18, 19].

BMI was defined as follows

- Normal weight : BMI of 18.5 - 24.9 kg/m^2

- Underweight : BMI of less than 18.5 kg/m^2
- Overweight : BMI of 25 - 29.9 kg/m^2
- Obesity : BMI of 30.0 – 39.9 kg/m^2
- Morbidly Obese : BMI of > 40.0

Other definitions for characteristics of the study subjects were as follows

- Anaemia as per WHO definition, Men Hb 13-16g/dl, Female 12-14g/dl.
- Elderly- was defined as anybody who is having an age of fifty years and above
- Renal insufficiency was defined by elevated creatinine level, i.e. above 115 μmol/L [20].

Results

Between October 2016 to October 2017 a total of 326 patients with cardiovascular diseases were admitted in the medical wards of which 209 (64%) were elderly (older than 50 years of age). Of all admitted elderly patients, 185 (88.5%) patients consented and participated in the study. Their mean age was 66 ± 9.2 years with majority (62.7%) being male. Smoking was significantly more common in males (p=0.03). Both male and female patients had elevated serum creatinine but much severe in male patients. Study participants had normal mean serum cholesterol. (Table 1)

Presenting symptoms and signs of cardiovascular disease in elderly patients

The most common symptoms were palpitation and dyspnoea found in 117 (63.2%) and 115 (62.2%) respectively. Least common were abdominal pain (right upper quadrant) and fainting reported in 21 (11.4%) and 1 (0.5%) patients respectively (Table 2).

Presenting signs of cardiovascular disease in elderly patients

The common signs were oedema and basal crepitations found in 49 (26.5%) and 47 (25.4%) respectively. Elevated blood pressure greater than 130/85mmHg was found in 125(65%). Least common were cyanosis and diastolic murmurs reported in 3 (1.6%) and 2 (1.1%) patients respectively (Table 3)

Distribution of clinical diagnosis

Hypertension was the most frequent condition encountered in both males and females patients whereas peripheral vascular disease was the least common (1.6%). There were no significant gender differences on the pattern of clinically diagnosed cardiovascular diseases among studied patients (p>0.05). Table 4 shows the results.

Types of cardiovascular disease diagnosis by echocardiography

Table 5 shows the relationship between age and echocardiographic abnormalities. Diastolic dysfunction demonstrated significant difference with age (p=0.03); elderly patients aged 65 years or older were likely to have diastolic dysfunction than those less than 65 years. Other echocardiographic abnormalities did not exhibit significant difference with age (p>0.05).

Figure 1 shows the distribution of electrocardiographic findings of studied patients.

Seventy (37.8%) had normal ECG findings. Left ventricular hypertrophy and sinus tachycardia were the commonest findings.

Co-morbidities condition associated with cardiovascular disease.

Table 6 shows the commonest co-morbid conditions were anaemia in 167 (90.3%) and hyponatraemia in 98 (53.0%) respectively. Least common was malignancy in 4 (2.2%)**.**

Discussion

Among patients with cardiovascular disease admitted in medical ward at Vikhe Patil Memorial Hospital for a one-year period, the proportion of elderly patients was 33%. This figure is relatively higher than that reported in the USA (12.4%) in the year 2000. Inconsistency in these figures could be attributed to differences in ages of elderly studied. Thus, in our study elderly patients were taken to have the age at least 50 years while in the USA study, elderly were taken to be at least 65 years of age.

The commonest clinical presentations of the elderly patients with cardiovascular disease were palpitation, dyspnoea and oedema. A similar description was documented in a study [21].

Consistent to the Framingham Heart study, palpitations, dyspnoea/breathlessness, orthopnoea, pedal oedema and right upper quadrant abdominal pain were significantly associated with the presence of cardiac abnormalities [22]. The palpitation was also independently associated with hypertension. Chest pain was reported by 31% of patients with none of them diagnosed to have acute coronary syndrome [23]. Also, dyspnoea has been associated with age-related diastolic dysfunction, lung changes or associated pulmonary disease [24]. Thus, as reported in our study, elderly patients aged at least 65 years were likely to develop diastolic dysfunction and hence higher prevalence of dyspnoea.

In this study about two third of patients (69%) were clinically diagnosed to have cardiovascular disease. This high rate is not surprising because cardiovascular disease is the most frequent diagnosis in elderly people [6]. In this study the prevalence of hypertension was found to be 68%. This was higher than previously reported in a study done in India, where prevalence was 54% [10]. However, this prevalence was similar to that found in America where more than 60% of patients older than 65 years were hypertensive [9]. The variation of this prevalence rate can be explained by difference in diagnostic cut off points for hypertension in different studies. Congestive cardiac failure was the second clinical diagnosis affecting 19% of elderly patients. A similar prevalence was reported in America where heart failure contributed to at least 20% of hospital admissions of patients older than 65 years [14]. However, this prevalence was low compared to that found in India where 39% of studied patients had congestive cardiac failure. The differences in the prevalence rates can be explained by definition of elderly in these studies. For example, we defined an elderly patient to be older than fifty years while the Indian study used patients older than 60 years [10].

Significant gender differences in prevalence of different type's cardiovascular conditions were not exhibited in this study.

Similar findings were also demonstrated in the some study whereby no gender differences in prevalence of cardiovascular disease were observed [25]. Also, this finding concurs with the American study which compared prevalence and incidence of cardiovascular disease between men and women in a long-term health care facility where it was reported that the prevalence of hypertension, CAD, and stroke were similar in male and female. However, they found significantly higher prevalence of atrial fibrillation and Peripheral Arterial Disease in male compared to women [26]. The differences in findings between our study and the American study could be attributed to the bigger sample size used in the American study (185 for our study vs. 3624 in the American study).

Our study exhibited significant age difference in the prevalence of diastolic dysfunction with elderly aged at least 65 years being likely to develop diastolic dysfunction than their counterparts younger than 65 years. It has been shown that patients with diastolic dysfunction are generally older than 65 years. A history of hypertension has been associated with in more than 60% of elderly patients with diastolic dysfunction.[26] This could be a possible explanation to the observed difference in our study since the prevalence of hypertension was high (68%). Forty five percent of our patients were diagnosed to have left ventricular hypertrophy using echocardiogram. However, of 125 patients with hypertension, 66% were also diagnosed to have LVH secondary to hypertension. Thus, it is likely that hypertension is the most important cause of their left ventricular hypertrophy. In several studies the prevalence rates of left ventricular hypertrophy have been reported to be 25-48%; which is consistent to our findings. However, in this study there were no gender differences on left ventricular hypertrophy among hypertensive patients as found in Framingham study [27].

Using electrocardiogram (ECG), left ventricular hypertrophy was diagnosed in 27% of our patients. ECG is usually very specific but less sensitive in diagnosing left ventricular hypertrophy [28]. Left ventricular diastolic dysfunction was diagnosed in 31% of studied patients contrary to the reported rates of 55 to 59 % in other studies [19, 29]. These studies used older patients (>65 years) than our study. The commonest co-morbid conditions in elderly patients with cardiovascular disease were anaemia and hyponatremia (in 90% and 53% respectively). It has been shown that prevalence of anaemia increases with age and its prevalence varies from 8 to 44 percent with its peak at 85 years or older [30, 31]. This has been attributed to prevalence of chronic disease and iron deficiency in elderly [32]. Hyponatremia has been indicated to be a common condition in elderly, especially those hospitalized or living in long-term care facilities [33]. The possible explanation for this could be that aging process is usually accompanied by maladaptations in different organ systems and physiologic functions including the kidney. This leads to renal insufficiency and hence hyponatremia.

Tables and Figures

Table 1: Characteristics of the study patients at between October 2016 to October 2017 stratified by sex

Characteristic	Male N = 116	Female N = 69	P value
Mean age (SD), years	66.3 (9.2)	65.8 (9.7)	1.00
Age groups			
50-59	24 (20.7)	19 (27.5)	0.54
60-69	47 (40.5)	27 (39.1)	
70+	45 (38.8)	23 (19.8)	
BMI, mean (SD) kg/m2	24.0 (3.9)	23.7 (4.0)	0.57
Hypertension, n (%)	78 (67.2)	47 (68.1)	1.00
Smoking, n (%)	22 (19)	5 (7.2)	0.03
Hb, mean (SD), g/dl	10.0 (2.6)	9.7 (2.6)	0.49
Cholesterol, mean (SD) mmol/L	4.3 (5.3)	4.0 (1.6)	0.65
Creatinine, log mean (SD) µmol/L	2.1 (0.3)	2.1 (0.3)	0.48
Sodium, mean (SD) mmol/L	134.1 (7.0)	134.8 (6.8)	0.55
Potassium, mean (SD) mmol/L	4.3 (3.4)	4.3 (0.9)	0.98

Table 2: Distribution of common presenting cardiovascular symptoms in elderly patients (n=185)

Symptoms	No. (%)	Male	Female	P value
Palpitations	117 (63.2)	69 (59.50	48 (69.6)	0.17
Dyspnoea/breathlessness	115 (62.2)	69 (59.5)	46 (66.7)	0.33
Orthopnoea	79 (42.7)	49 (42.2)	30 (43.5)	0.87
Cough	69 (37.3)	42 (36.2)	27 (39.1)	0.69
Chest pain	58 (31.4)	37 (31.9)	21 (30.4)	0.84
Pedal oedema	52 (28.1)	35 (30.2)	18 (26.1)	0.55
Paroxysmal nocturnal dyspnoea	31 (16.8)	23 (19.8)	8 (26.1)	0.15
Abdominal pain	21 (11.4)	12 (10.3)	9 (13.0)	0.58
Fainting	1 (0.5)	1 (0.9)	0 (0.0)	0.44

Table 3: Distribution of common presenting cardiovascular signs in elderly patients (n=185)

Signs	No. (%)	Male	Female	P value
Oedema	49 (26.5)	33 (28.4)	16 (23.2)	0.43
Basal crepitations	47 (25.4)	27 (23.3)	20 (29.0)	0.39
Hepatomegaly (tender)	38 (20.5)	23 (19.8)	15 (21.7)	0.76
Cachexia and muscle wasting	24 (13.0)	15 (12.9)	9 (13.0)	0.98
Elevated jugular venous pressure	18 (9.7)	9 (7.8)	9 (13.0)	0.24
Ascites	18 (9.7)	10 (8.8)	8 (11.6)	0.51
Displaced apex beat	16 (8.6)	12 (10.3)	4 (5.8)	0.29
Tachycardia	11 (5.9)	8 (6.9)	3 (4.3)	0.48
Third heart sound	6 (3.2)	5 (4.3)	1 (1.4)	0.29
Systolic murmurs	5 (2.7)	3 (2.6)	2 (2.9)	0.90
Right ventricular heave	4 (2.2)	2 (1.7)	2 (2.9)	0.63
Cyanosis	3 (1.6)	3 (2.6)	0 (0.0)	0.18
Diastolic murmurs	2 (1.1)	2 (1.2)	0 (0.0)	0.27

Table 4: Distribution of clinical diagnosis of cardiovascular conditions among elderly patients by sex

Types of CVS disease	All patients N = 185	Male N = 116	Female N = 69	P value
Hypertension, n(%)	125 (67.6)	78 (67.2)	47 (68.1)	1.00
Congestive Cardiac failure, n(%)	35 (18.9)	22 (18.9)	13 (18.8)	0.13
Stroke, n(%)	31 (16.8)	22 (19)	9 (13)	0.30
Valvular Heart Disease, n(%)	27 (14.9)	10 (8.6)	17(24)	0.32
Atrial Fibrillation, n(%)	9 (4.9)	5 (4.3)	4 (5.8)	0.65
Peripheral Vascular Disease, n(%)	3 (1.6)	3 (2.6)	0	0.09

Table 5: Distribution of Echocardiographic findings in the study population by age

Type of echocardiographic Abnormalities	All patients N =185	Less than 65 N =86	65 or older N =99	P value
LVH secondary to hypertension, n (%)	83 (44.9)	38 (44.2)	45 (45.5)	0.86
Diastolic dysfunction, n (%)	58 (31.4)	20 (23.3)	38 (38.4)	0.03
Systolic dysfunction, n (%)	47 (25.4)	22 (25.6)	25 (25.3)	0.96
Sclerotic aortic valve, n (%)	25 (13.5)	11 (12.8)	14 (14.1)	0.79
Hypertensive dilated Cardiomyopathy, n (%)	17 (9.2)	10 (11.6)	7 (7.1)	0.29
Dilated cardiomyopathy, n (%)	15 (8.1)	9 (10.5)	6 (6.1)	0.27
Pericardial effusion, n (%)	14 (7.6)	10 (11.6)	4 (4.0)	0.09
Mitral regurgitation, n (%)	8 (4.3)	5 (5.8)	3 (3.0)	0.47
Rheumatic mitral stenosis, n (%)	5 (2.7)	1 (1.2)	4 (4.0)	0.37
Aortic regurgitation, n (%)	5 (2.7)	2 (2.3)	3 (3.0)	1.00

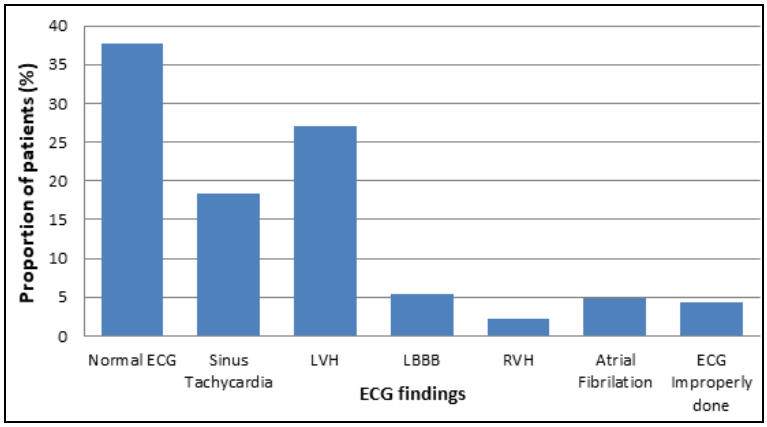

Fig 1: Electrocardiographic findings among elderly with cardiovascular disease (n=185)

LVH - left ventricular hypertrophy; RVH - right ventricular hypertrophy
LBBB - left bundle branch block (partial or complete)

Table 6: distribution of co-morbid conditions in elderly with cardiovascular disease

Co-morbid condition	All N=185	Male N=116	Female N =69
	No. (%)	No. (%)	No. (%)
Diabetes	38 (20.5)	21 (18.1)	17 (24.6)
Stroke	31 (16.8)	22 (19)	9 (13)
Anaemia	167 (90.3)	103 (88.8)	64 (92.8)
Renal insufficiency	66 (35.7)	40 (34.5)	26 (37.7)
Hypernatraemia	9 (4.9)	6 (5.2)	3 (4.3)
Hyponatraemia	98 (53.0)	65 (56.0)	33 (47.8)
Hypercholestremia	36 (19.5)	20 (17.2)	16 (23.2)
Hyperkalemia	12 (6.5)	6 (5.2)	6 (8.7)
Hypokalemia	35 (18.9)	25 (21.6)	10 (14.5)
Malignancy	4 (2.2)	4 (3.4)	0 (0.0)
Hypoglycemia	59 (31.9)	38 (32.8)	21 (30.4)

Conclusions

Hypertension, congestive heart failure and left ventricular hypertrophy were the commonest cardiovascular diseases among elderly patients are frequently associated with diabetes mellitus, anaemia, stroke and renal impairment. No any case identified with coronary artery disease.

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