Age Distribution of Aortic Sclerosis among Bangladeshi Population

Mohammed Abaye Deen Saleh[1], Pratyay Hasan[2], Khyrun Nahar[3], Abdul Wadud Chowdhury[4], Mohsin Ahmed[5], Syed Rezwan Kabir[6], Md. Gaffar Amin [7], Kazi Nazrul Islam[8]

Abstract:

Aortic sclerosis (ASc) is defined as thickening or calcification of the aortic valve without significant obstruction of blood flow. Aortic sclerosis is diagnosed when in echocardiography, thickening and calcification of one or more cusps of a tricuspid aortic valve is manifested, whereas in aortic stenosis, cusp separation is restricted and the velocity through the aortic valve is > 2.5 m/s. Its prevalence increases with age. Aortic valve stenosis is associated with systemic endothelial dysfunction, and it carries a 50% increase in risk of cardiac death or myocardial infarction. As aortic sclerosis has proved to be more and more relevant in recent days, it has been important to identify epidemiological data and demographic information of aortic sclerosis in Bangladeshi population. This study tried to determine age distribution of aortic sclerosis in Bangladehsi population.

Median age of aortic sclerosis patients was 65 years (mean 67 ± 12 years), most of the patients (17.2%) were in 56-60 years of age group. The same statement holds correct for females, where highest number of patients (7.7% of total patients) were in the same age group. For the males, the highest number of patients (11% of total patients) were in 61-65 years of age group. The minimum age was 45 years for both males and females. Although the minimum age is same for both sex, females are affected a bit earlier than males, and statistically significant difference was found between mean ages of two sexes. Most of the aortic sclerotic patients are below the usually used age cut off of 65 years. There is significant difference between mean age of presentation of aortic sclerosis between males and females. Further study should be undertaken to understand these effects more clearly.

Keywords: Aortic Valve, Cardiology, Sclerosis, Echocardiography, Age distribution.

1. Registrar, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.
2. Indoor Medical Officer, Department of Medicine, Dhaka Medical College Hospital, Dhaka, Bangladesh.
3. Outdoor Medical Officer, Pediatrics Outpatient Department, Dhaka Medical College Hospital, Dhaka, Bangladesh.
4. Professor & Head, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.
5. Associate Professor, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.
6. Junior Consultant, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.
7. Assistant Professor, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.
8. Junior Consultant, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh.

Address of Correspondence: Dr. Mohammed Abaye Deen Saleh, Registrar, Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh. Tel: +8801716066735, Email: sarahcosis@gmail.com.

Introduction:

Aortic sclerosis (ASc) is defined as thickening or calcification of the aortic valve without significant obstruction of blood flow.[1] Aortic sclerosis is diagnosed when in echocardiography, thickening and calcification of one or more cusps of a tricuspid aortic valve is manifested, whereas in aortic stenosis, cusp separation is reduced and the velocity through the aortic valve is > 2.5 m/s.[2] Its prevalence increases with age.[1,3] In the Monica-KORA study of 935 European adults aged 35 to 84 years, the prevalence of aortic sclerosis increased across the age distribution from 7 percent in those age 35 to 44 years to 65 percent in those age 75 to 84 years.[4] Aortic valve sclerosis is associated with systemic endothelial dysfunction,[5] and it carries a 50% increase in risk of cardiac death or myocardial infarction.[2] In 2279 middle aged African Americans, the presence of aortic sclerosis conferred a hazard ratio of 3.8 for myocardial

infarction or fatal coronary heart disease after adjustment for multiple risk factors.[6] It is also found that AV sclerosis is associated with several CV risk factors and predicted CV events independently of prevalent CV disease and traditional CV risk factors, including LV mass and ejection fraction.[7] Sui et.al. found that there were significant similarities in clinical risk factors, histopathological alterations of AVS and coronary atherosclerosis.[8] Kim et.al. found that aortic valve sclerosis on echocardiography is a good predictor of coronary artery disease in patients with an inconclusive treadmill exercise test.[9] As aortic sclerosis has proved to be more and more relevant in recent days, it has been important to identify epidemiological data and demographic information of aortic sclerosis in Bangladeshi population. This study tried to determine the age distribution of aortic sclerosis in Bangladeshi popualtion.

Methods:

Sampling technique
The patients were included from a diagnostic center, by consecutive sampling technique. All the patients that met the criteria of aortic sclerosis were included in this study. Enrollments of patients were done over one-year period.

Two-dimensional transthoracic echocardiography
2D transthoracic echocardiography was performed using a 4 MHz Sequoia C256 probe (Medison Inc,). 2D echocardiographic tests and Doppler tests were performed following the Standard Practical Guideline for 2D echocardiography from the American Society of Echocardiography.[10] The area of the aortic valve orifice on the sternal left margin was measured using a static image in which the 3 cusps were most widely open, while the aortic valve blood flow speed was measured in the apical 5-chamber view using a continuous wave Doppler.[9] These measurements were taken three times and the average was used in analysis.

Aortic valve sclerosis measurement
Using a long axis view of the left sternal margin, valve thickness was defined as the value obtained by enlarging the area of the aortic valve, and measuring the thickest part of the right coronary aortic cusp as well as the non-coronary aortic cusp during the systolic period. Using a short axis view of the left sternum margin, when movements of the right coronary aortic cusp and non-coronary aortic cusp during the systolic period were examined by enlarging the aortic root, a valve opening inward concave was defined as normal, whereas a valve opening inward flat or inward convex was defined as showing restricted motion.[11]

Definition of aortic sclerosis
Patients were included as case of aortic sclerosis if they showed one the following criteria on trans-thoracic echocardiogram (TTE):[9,12,13]

1. Aortic cusp thickness was >2 mm
2. Aortic valve cusps showed restricted motion.
AND,
3. Aortic jet velocity (m/s) $\leq$2.5 m/s.[13,14]

Exclusion criteria
1. Patients who did not meet either of the first two criteria.
2. Patients who did not give consent.

Statistical analysis
Statistical analyses were done with Statistical Package for Social Sciences (SPSS) version 23 (IBM Corporation, USA). Descriptive statistics and graphs are derived, and independent Student's t test and Mann-Whitney U test were employed to determine any significant differences between means.

Result:
A total of 209 patients were selected in this study, among which 135 (64.59%) were male and 74 (35.41%) were female (Figure 1).

Age distribution of the different sex groups are shown in Table 1 and 2 and Figure 2 and 3.

An independent sample t test and Mann-Whitney U test were employed assessing differences between mean age of male and female, both came significant (p=0.014, Table 3).
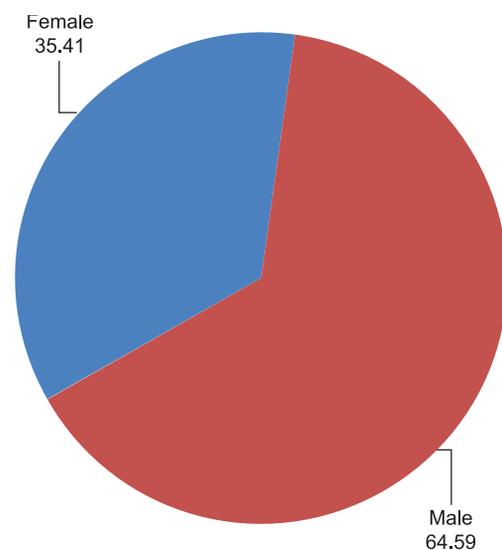

Fig.-1: *Sex distribution*

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Table-I

Age distribution of the patients in different sex groups

			Mean	Median	Minimum	Maximum	Standard Deviation
Age	Sex	Male	68	70	45	100	12
		Female	64	65	45	90	11
		Total	67	65	45	100	12

Table-II

Percentage of patients in different age groups

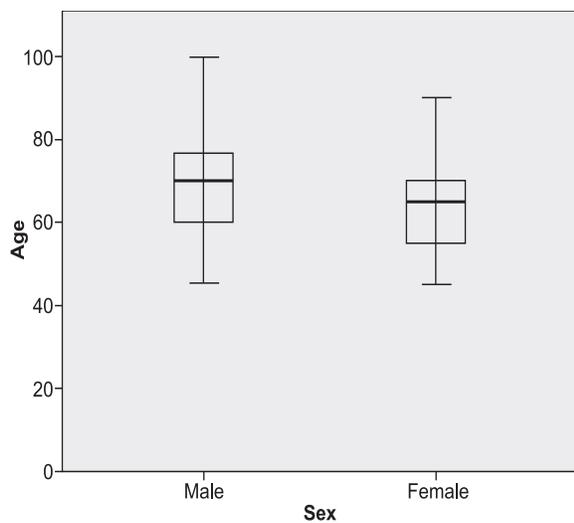|		Sex					
		Male		Female		Total	
		Count of total %	Percentage	Count of total %	Percentage	Count of total %	Percentage
Age Categories	41-45	3	1.4%	1	0.5%	4	1.9%
	46-50	7	3.3%	12	5.7%	19	9.1%
	51-55	12	5.7%	7	3.3%	19	9.1%
	56-60	20	9.6%	16	7.7%	36	17.2%
	61-65	23	11.0%	7	3.3%	30	14.4%
	66-70	22	10.5%	13	6.2%	35	16.7%
	71-75	13	6.2%	9	4.3%	22	10.5%
	76-80	20	9.6%	5	2.4%	25	12.0%
	81-85	8	3.8%	1	0.5%	9	4.3%
	86-90	4	1.9%	3	1.4%	7	3.3%
	91-95	0	0.0%	0	0.0%	0	0.0%
	96-100	3	1.4%	0	0.0%	3	1.4%
	Total	135	64.6%	74	35.4%	209	100.0%

Fig.-2: *Age distribution of the patients in different sex groups*
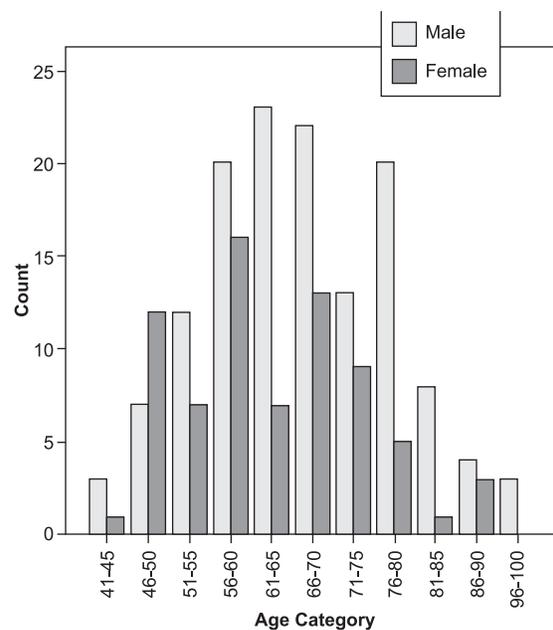

Fig.-3: *Percentage of patients in different age groups*

Table-III

Independent sample t test between two sex groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	P value	t	d f	P value (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Age	Equal variances assumed	.225	.636	2.468	207	.014	4.063	1.646	.818	7.309
	Equal variances not assumed			2.517	159.097	.013	4.063	1.614	.875	7.252

Discussion:

From the results, it is evident, that although median age of aortic sclerosis patients was 65 years (mean 67 ± 12 years), most of the patients (17.2%) were in 56-60 years of age group (Table 2, Figure 3). The same statement holds correct for females, where highest number of patients (7.7% of total patients) were in the same age group. For the males, the highest number of patients (11% of total patients) were in 61-65 years of age group. The minimum age was 45 years for both males and females irrespectively. From the boxplot (Figure 2), we can see the picture more clearly. Although the minimum age is same for both sex, females are affected a bit earlier than males, and statistically significant difference was found between mean ages of two sexes (Table 3).

In a meta-analysis, collecting information from 22 studies, Coffey et.al. found an increase of 1·5% in prevalence per year of increase in average age of study participants (95% confidence interval 0·75 to 2·25%, p=0·0007, R^2 0·549). This data is consistent with our findings, which shows most of the patients are from geriatric age groups. Völzke et.al. and Stewart et.al. reported age is an independent risk factor for aortic sclerosis.[15,16]

Stewart et.al. reported 5,201 subjects with >65 years of age enrolled in the Cardiovascular Health Study, aortic valve sclerosis was present in 26% and aortic valve stenosis in 2% of the entire study cohort; in subjects > 75 years of age, sclerosis was present in 37% and stenosis in 2.6%.[16] Stewart et. al. also reported in subjects > 75 years of age, prevalence of sclerosis is 37%.[16] But, in our study, 51.7% patients were below or up to 65 years of age, and 21% of patients were above 75 years of age. The reason for this may lie in the fact that many studies have been done where first a specific age group has been selected, and then the prevalence of aortic sclerosis or other CV outcomes statistics are determined in that age group.[17] But we took a different approach and enrolled patients by consecutive sampling which allowed us to determine demographic information including age, etc.

not restricted to some specific group. It is clearly seen in this study that most of the aortic sclerotic patients are actually below the usually used age cut off of 65 years.

In the Monica-KORA study of 935 European adults aged 35 to 84 years, the prevalence of aortic sclerosis increased across the age distribution from 7 percent in those age 35 to 44 years to 65 percent in those age 75 to 84 years.[4] But in our study, we had only 1.9% patients in 41-45 years age group, 16.3% in 76-85 years age group.

It is well known that there are sex-related differences in atherosclerosis progression, plaque composition and prevalence of microvascular disease.[18] But the differences of age of presentation of aortic sclerosis in different sexes are not well documented. In our study, there was significant difference between mean age of male and females. This finding contrasts with the results reported by Aksoy et.al. who did not find any such difference.[19]

Conclusion:

Most of the aortic sclerotic patients are actually below the usually used age cut off of 65 years. There is significant difference between mean age of presentation of aortic sclerosis between males and females. Further study should be undertaken to understand these effects more clearly.

List of abbreviations

ASc = Aortic sclerosis

CV = Cardiovascular

LV = Left ventricle

TTE = Trans-thoracic echocardiogram

Conflict of interest: None

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