

## “Prevalence of LAE and Its Associated Risk Factors among the Patients with Hypertension”

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**Abstract: Background:** Left atrial enlargement (LAE) has been proven to be significantly related to stroke and cardiovascular diseases. Previous studies have shown a link between Left atrial enlargement (LAE) with the increase in the risk of stroke and cardiovascular diseases (CVD). Bangladeshi data is lacking on the exact prevalence of LAE. **Aims and Objectives:** To study the prevalence of LAE and its associated risk factors. **Materials and Methods:** Hundred patients having were studied in the Department of Vascular Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), and Dhaka, Bangladesh from January 2020 to December 2020. After a complete physical examination, echocardiogram was performed in all the patients. In present study LAE is defined if the LA diameter is more than 4.0 cm in men and 3.8 cm in women. We performed multivariable logistic regression analysis to identify risk factors for LAE. **Results:** Prevalence of LAE was 8%. The prevalence of LAE was higher in men (9.37%). On multivariable logistic regression analysis advancing age (OR: 1.034), increased systolic blood pressure (SBP) (OR: 2.862), increased diastolic blood pressure (DBP) (OR: 1.32), abnormally high BMI (OR: 3.721), increased prevalence of diabetes (OR: 1.245), increased left ventricular myocardial index (LVMI) (OR: 1.023), and decreased left ventricular ejection fraction (LVEF), decreased heart rate (HR), and decreased estimated glomerular filtration rate (eGFR) were found to be the major risk factors of LAE. **Conclusion:** A significant number of patients had LAE. Among the risk factors advancing age, increased SBP, increased BMI, presence of diabetes mellitus, increased LVMI, decreased eGFR, decreased LVEF, and decreased HR were more common.

**Keywords:** Cardiovascular Diseases Left Atrial Enlargement, Systolic Blood Pressure and Regression Analysis Change.

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### INTRODUCTION

Hypertension is a significant public health concern and is one of the major causes of premature death worldwide. An estimated 1.13 billion people worldwide have hypertension. In 2015, a survey showed that 1 in 4 women and 1 in 5 men have hypertension. Fewer than 1 in 5 people have well-controlled hypertension [1], and more than 9 million deaths are associated with hypertension [2]. Previous studies have proved that there is an increased risk of cardiovascular disease (CVD) with the left ventricular structure and function [3]. Recent studies have confirmed the association of left atrial enlargement (LAE) with stroke and CVD [4, 5].

Many studies have found LAE to be more sensitive indicator for the developing CVD [6, 7]. It becomes very important to evaluate the prevalence and associated risk factors for the LAE. In Bangladesh there are limited studies evaluating the prevalence and associated risk factors of LAE. Echocardiographically measurement of left atrial dimensions can provide the real prevalence of patients having LAE. As the left atrium enlarges equally in all diameters [8] any one diameter is a reliable reflection of left atrial enlargement. Several previous studies have found a significant correlation between the left atrial size i.e. diameter, measured by echocardiography and angiography [9, 10]. Hence

present study is planned to investigate the prevalence of LAE in our tertiary care centre using echocardiographic examination and to explore independent risk factors of LAE. Therefore, the study of the prevalence of LAE and its risk factors is becoming increasingly important. However, very few studies conducted on the general population have focused on LAE. At present, almost all of the research is aimed at patients with high blood pressure (BP), or those who are hospitalized.

### MATERIALS AND METHODS

Present prospective study was performed on 100 patients who visited the Department of Vascular Surgery, Bangabandu Sheikh Mujib Medical University (BSMMU), and Dhaka, Bangladesh from January 2020 to December 2020. After a complete physical examination, echocardiogram was performed in all the patients. After a detailed demography including age, sex, height, weight, diabetes mellitus and Current smoking and drinking habit, a detailed laboratory investigations were performed including SBP (mmHg), DBP (mmHg), HR (bets /minuts), HDL-C (mg/dl), LDL-C (mg/dl), TG (mg/dl), TC (mg/dl), eGFR (mL/min/1.73 m2), Haemoglobin (g/L), LVDD (cm), IVST (cm), PWT (cm), LVMI (g/m2), LVEF (%) and E/A for all the patients.

### DATA ANALYSIS

All the data analysis was performed using IBM SPSS version 20.0 software. Quantitative data is expressed as mean and standard deviation whereas categorical data is expressed as percentage. Descriptive analysis was performed for the baseline details. Multivariable logistic regression analysis was performed to find out the odds ratio of each variable. P value of <0.05 is considered as significant.

### RESULTS

A total of 100 participants (68 women and 32 men) were included in the study. The mean age was 56.54 years. The overall prevalence of LAE was 8%. The prevalence of LAE was 7.53 % in women and 9.37 % in men. Patient baseline characteristics are shown in [Table-1]. Prevalence of LAE was 8%. The prevalence of LAE was higher in men (9.37%). On multivariable logistic regression analysis

advancing age (OR;1.034), increased systolic blood pressure (SBP) (OR: 2.862), increased diastolic blood pressure (DBP) (OR: 1.32), abnormally high BMI (OR: 3.721), increased prevalence of diabetes (OR: 1.245), increased left ventricular myocardial index (LVMI) (OR: 1.023), and decreased left ventricular ejection fraction (LVEF), decreased heart rate (HR), and decreased estimated glomerular filtration rate (eGFR) were found to be the major risk factors of LAE [Table 2].

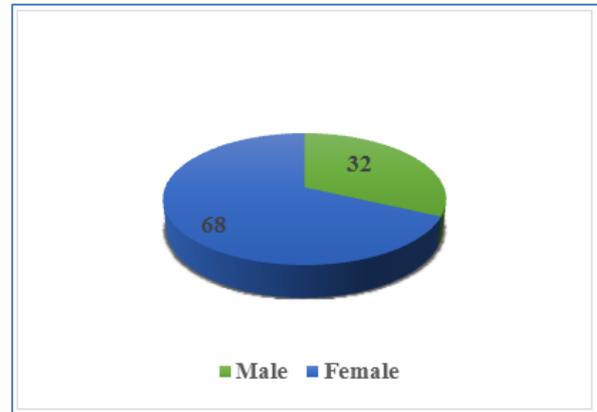


Fig-1: Sex distribution of patients

Table-1: Baseline characteristic of the patients

Parameters	LAE (n=8)
Age (years)	56.54 ± 11.42
Current smoking	37.5%
Current drinking	25%
SBP (mmHg)	152.23 ± 22.43
DBP (mmHg)	82.68 ± 10.52
HR (bets /minuts)	72.23 ± 8.90
BMI (Kg/m2)	27.65 ± 2.45
Diabetes mellitus	25%
HDL-C (mg/dl)	48.34 ± 6.32
LDL-C (mg/dl)	119.34 ± 12.85
TG (mg/dl)	167.89 ± 21.42
TC (mg/dl)	208.04 ± 24.11
eGFR (mL/min/1.73 m2)	88.02 ± 18.51
Haemoglobin (g/L)	138.28 ± 24.50
LVDD (cm)	5.07 ± 0.55
IVST (cm)	1.01 ± 0.38
PWT (cm)	0.96 ± 0.36
LVMI (g/m2)	110.44 ± 87.80
LVEF (%)	61.33 ± 4.77
E/A	0.91 ± 0.74

**Table-2: Multivariable logistic regression analysis of risk factors related to left atrial enlargement**

Parameters	LAE	P value
Gender	1.38 (1.023-1.447)	0.049
Age (years)	1.04 (1.025-1.038)	0.002
Current smoking	0.81 (0.527-0.928)	0.001
Current drinking	1.24 (1.021-1.71)	0.036
SBP $\geq$ 140	2.82 (1.682-2.988)	<0.001
DBP $\geq$ 80	1.32 (1.068-1.623)	0.022
HR (bets /minuts)	0.98 (0.967-0.998)	<0.001
BMI $\geq$ 30	3.712 (3.216-4.678)	<0.001
Diabetes mellitus	1.25 (1.04-1.988)	<0.001
TG (mg/dl)	0.876 (0.867-1.281)	0.423
TC (mg/dl)	1.121 (0.989-1.683)	0.442
eGFR (mL/min/1.73 m2)	0.968 (0.946-0.998)	0.002
Anemia	1.124 (0.989-1.682)	0.058
LVMI	1.023 (1.001-1.043)	<0.001
LVEF	0.884 (0.786-0.946)	<0.001
E/A	0.882 (0.723-1.143)	0.228

## DISCUSSION

The overall prevalence of LAE was 8%. The prevalence of LAE was 7.53 % in women and 9.37 % in men. In agreement to present study a study from Bangladeshi including 11,956 subjects aged  $\geq$ 30 years reported that the overall prevalence of LAE was 6.43 % for subjects aged over 30 years. The prevalence of LAE was 6.78 % in women and 6.02 % in men [11]. Another study from Poland reported the high prevalence (15.7 %) of LAE when cut off of LA diameter in an urban population of Poland was used. As for the indexed LA diameter, the prevalence was 8.8% [1]. In present study we found that advancing age and female sex were significantly associated with LAE which is line with the previous studies [13, 14]. Possible reasons for increasing the prevalence with advancing age may be due to valvular degeneration, cardiac systolic or diastolic dysfunction and hypertension. In our series, high SBP was significantly associated with LAE. In agreement to present study previous study by Stritzke et al., also found that LA pressure load in hypertensive individuals resulted in an increase in LA size [15]. Furthermore, in our series it was found that presence of diabetes mellitus and lower eGFR were found to be significant predictor of LAE in the general population. This is in line with the previous study done by Cuspidi et al., and Hirst et al., [16, 17]. Previous studies confirmed that higher LVMI was associated with left atrial size [16, 18]. Additionally, the association between BMI and LAE was shown to be the most obvious in our study, which was consistent with many other studies [19, 20]. Especially, Stritzke et al. reported that obesity appears to be the most important risk factor for LAE in the general population [20]. We also found an important result: diabetes and lower eGFR were positively associated with LAE in the general

population, which was also consistent with previous studies [21, 22]. However, in our study, the association between diabetes, eGFR and LAE was only observed in men but not in women, after adjusting for sex. Present study is the affirmation for the findings of these studies. Appleton et al. showed that increased LVMI was related to increased LV stiffness and increase in LV filling pressure, which leads to LA enlargement [13].

## CONCLUSION

In our population we found that the prevalence of LAE not as high as that in European and American countries. No significance difference in prevalence was found between both the sexes. Advancing age, high SBP, high DBP, and high BMI, high prevalence of diabetes, high LVMI, and lower LVEF, lower heart rate, and lower eGFR were found to be the major risk factors of LAE.

## Availability of Data and Materials

All of data and materials are availability.

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