



# HYPERTENSION AS A RISK FACTOR FOR ATRIAL FIBRILLATION IN PATIENTS PRESENTING IN OUTDOOR DEPARTMENT OF TERTIARY CARE HOSPITALS

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## ABSTRACT:

**BACKGROUND:** Hypertension is one of the major cause of vascular disease leading to cerebrovascular events, coronary heart disease and peripheral vascular disease. Hypertension is associated with atrial fibrillation. If both problems combine, the prognosis may be fatal.

**OBJECTIVE:** To assess the association of hypertension with atrial fibrillation in patients presenting in outdoor departments of two tertiary care hospitals.

**Materials and Methods:** This case control study was conducted at departments of cardiology, outdoor patients (OPD) of Mayo hospital and Jinnah Hospital, Lahore for six months from January to June, 2017. Cases of atrial fibrillation and controls without atrial fibrillation were included. Blood pressure was noted and history of hypertension was noted and patient taking antihypertensive was observed. Odds ratio was calculated.

**RESULTS:** The mean age of cases was  $50.37 \pm 6.01$  years and the mean age of controls was  $50.33 \pm 6.09$  years. There were 79 (43.9%) males and 101 (56.1%) females in case group while there were 91 (50.6%) males and 89 (49.4%) females in control group. The mean SBP of cases was  $151.38 \pm 27.48$  mmHg and of controls was  $132.92 \pm 21.98$  mmHg. The mean DBP of cases was  $89.28 \pm 11.09$  mmHg while of controls was  $82.14 \pm 9.64$  mmHg. There was significantly high SBP and DBP among cases as compared to controls ( $p < 0.001$ ). But the history of use of antihypertensive was almost comparable in cases and controls i.e. 81.5% vs. 81.6%,  $p > 0.05$ . Among cases, hypertension was present in 108 (60.0%) patients while among controls, hypertension was present in 38 (21.1%) patients. The odds ratio of atrial fibrillation was 5.605 (95% CI; 3.518-8.932) in patients of hypertension ( $p < 0.001$ ).

**CONCLUSION:** There is a significant association of hypertension with atrial fibrillation.

**Key words:** hypertension, blood pressure, atrial fibrillation

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## INTRODUCTION:

**B**lood pressure is a measurement of the force exerted against the walls of arteries as heart pumps blood to body. Hypertension is the term used to describe high blood pressure. It usually does not cause symptoms.<sup>1</sup> Hypertension occurs in 16-37% people all over the world. In 2010, 18% (9.4million) deaths occurred due to hypertension.<sup>2</sup> Long standing hypertension is a major risk factor for cardiovascular diseases, heart failure, stroke, peripheral vascular disease, loss of vision and renal failure.<sup>3,4</sup>

According to a review, drop in blood pressure by 5mmHg can reduce the risk of coronary artery disease by 21% while of stroke by 34% and also decrease the probability of heart failure, dementia and deaths due to cardiovascular diseases.<sup>5</sup> Lifestyle modifications and proper medications can reduces blood pressure and decline the risk of complications.<sup>6,7</sup>

It causes progressive damage to arteries and veins, which can inhibit blood-flow throughout the body. This can cause not only cardiovascular diseases and heart failure but also damage kidneys, peripheral vascular system and eyes.<sup>8</sup> This stresses blood vessels, causing them to clog or weaken. It can lead to atherosclerosis and narrowing of blood vessels making them more likely to block from blood clots or bits of fatty material breaking off from the lining of wall of blood vessels.<sup>9,10</sup>

Hypertension is one of the most common cardiovascular syndrome effecting 20-50% adults in developed countries.<sup>9,12</sup> Hypertension increases the risk for cardiac arrhythmias. Arrhythmias include atrial fibrillation, premature ventricular contrac-

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tions, and ventricular tachycardia.<sup>11</sup> More than 6 million Europeans have atrial fibrillation, and its prevalence will be doubled in next 50 years as this population ages.<sup>13</sup> Due to the high prevalence of hypertension, atrial fibrillation was high due to this factor than any other risk factor.<sup>14, 15</sup>

Epidemiological data showed relationship of arterial hypertension with atrial fibrillation, thus hypertension is common in atrial fibrillation patients. Besides epidemiological relationships, hypertension and atrial fibrillation have many similar mechanisms of pathogenesis.<sup>16</sup> So we did this study to get evidence regarding the association of hypertension with atrial fibrillation.

**OBJECTIVE:**

To assess the association of atrial fibrillation with hypertension in patients presenting in outpatient departments of tertiary care hospitals.

**MATERIAL AND METHODS:**

This case control study was conducted at departments of cardiology, outdoor patients (OPD) of Mayo hospital and Jinnah Hospital, Lahore for six months from January to June, 2017. Cases of atrial fibrillation and controls without atrial fibrillation were included. Blood pressure was noted and history of hypertension and antihypertensive medicine was taken. Odds ratio was calculated.

Sample size of 360 patients was estimated using 95% confidence level, 5% margin of error and taking expected frequency of hypertension as 37%.

Patients aged between 40-60 years, both genders with ECG diagnosis of atrial fibrillation (p-wave absent on 12 lead ECG and unequal R-R interval and QRS complex < 120ms assessed on ECG) were taken as cases while patients without atrial fibrillation were taken as control.

Patients with congenital cardiac abnormalities, patients with structural heart disease and patients who undergone CABG were excluded from the study.

360 patients presenting in the Department of Cardiology, fulfilling the inclusion criteria was included in the study. Informed consent was obtained. Demographic details of patients (name, age, sex, BMI) were obtained. Patients already diagnosed with atrial fibrillation were included as cases. Controls were included as they have sinus rhythm. Then patients were evaluated for blood pressure. If BP ≥ 140/90mmHg on two occasions, 4 hours apart and patient had history of anti-hypertensive drugs, then hypertension was labeled.

SPSS version 21.0 was used to enter and analyze the data. Odds ratio was calculated to mea-

sure association between hypertension and atrial fibrillation. OR > 1 was considered as significant risk of association.

**RESULTS:**

In this study, we included 360 patients; 180 cases and 180 controls. The mean age of cases was 50.37 ± 6.01 years and the mean age of controls was 50.33 ± 6.09 years. There were 79 (43.9%) males and 101 (56.1%) females in case group while there were 91 (50.6%) males and 89 (49.4%) females in control group. Table 1

**Table 1: Demographic characteristics of patients**

	Case	Control
n	180	180
Age (years)	50.37±6.01	50.33±6.09
Gender		
Male	79 (43.9%)	91 (50.6%)
Female	101 (56.1%)	89 (49.4%)

**Table 2: Evaluation of patients for hypertension**

Characteristics	Case	Control	Significance
SBP (mmHg)	151.38±27.48	132.92±21.98	0.000
DBP (mmHg)	89.28±11.09	82.14±9.64	0.000
Taking anti-hypertensive drugs	108 (81.5%)	38 (81.6%)	0.989

**Table 3: Association of hypertension with atrial fibrillation**

		Group		Total	OR 95% CI
		Case	Control		
Hypertension	Yes	108 (60.0%)	38 (21.1%)	146 (40.6%)	5.605
	No	72 (40.0%)	142 (78.9%)	214 (59.4%)	3.518-8.932
Total		180 (100%)	180 (100%)	360 (100%)	

**Table 4: Association of hypertension with atrial fibrillation according to confounders**

Age	Hypertension	Group		Total	OR 95% CI
		Case	Control		
40-50years	Yes	54 (61.4%)	17 (19.3%)	71	6.633
	No	34 (38.6%)	71 (80.7%)	105	3.356-13.110
	Total	88	88	176	
50-60years	Yes	54 (58.7%)	21 (22.8%)	75	4.805
	No	38 (41.3%)	71 (77.2%)	109	2.534-9.109
	Total	92	92	184	
Male	Yes	43 (61.4%)	19 (19.3%)	62	4.526
	No	36 (38.6%)	72 (80.7%)	108	2.312-8.863
	Total	79	91	170	
Female	Yes	65 (58.7%)	19 (22.8%)	84	6.652
	No	36 (41.3%)	70 (77.2%)	106	3.472-12.746
	Total	101	89	190	

The mean SBP of cases was 151.38 ± 27.48 mmHg while mean SBP of controls was 132.92 ± 21.98 mmHg. The mean DBP of cases was 89.28 ± 11.09 mmHg while mean DBP of controls was 82.14 ± 9.64 mmHg. There was significantly high SBP and DBP among cases as compared to controls (p < 0.001). But the history of



taking antihypertensive was almost equal in cases and controls i.e. 81.5% vs. 81.6%,  $p > 0.989$ . Table 2

Among cases, hypertension was present in 108 (60.0%) patients while 72 (40.0%) were non-hypertensive. But among controls, hypertension was present in 38 (21.1%) patients while 142 (78.9%) were non-hypertensives. The risk of atrial fibrillation was 5.605 (95% CI; 3.518-8.932) in patients of hypertension ( $p < 0.001$ ). Table 3

We stratified data for age of patients. Among patients of 40-50 years age, 54 (61.4%) cases and 17 (19.3%) controls were hypertensive (OR=6.633, 95% CI: 3.356-13.110). Among patients of 50-60 years age, 54 (58.7%) cases and 21 (22.8%) controls were hypertensive (OR=4.805, 95% CI: 2.534-9.109). We stratified data for gender of patients. Among male patients, 43 (61.4%) cases and 19 (19.3%) controls were hypertensive (OR=4.526, 95% CI: 2.312-8.863). Among female patients, 65 (58.7%) cases and 19 (22.8%) controls were hypertensive (OR=6.652, 95% CI: 3.472-12.746). Table 4

## DISCUSSION:

Globally, atrial fibrillation is one of the major health problems, and incidence increases as population gets older, mainly in rapidly developing countries including Asian countries. Furthermore, the rate of atrial fibrillation may be miscalculated, not only in low and middle income countries, but also in high-income countries. Further researches are required to confirm the global burden of atrial fibrillation and detect major risk factors.<sup>17, 18</sup>

Hypertension is most common cardiovascular syndrome and atrial fibrillation is most important arrhythmia. Both these syndromes commonly co-exist and their frequency increases promptly with age. There are certain risk factors and clinical illnesses influencing the occurrence of atrial fibrillation, but owing to high prevalence, hypertension is still a main risk factor for atrial fibrillation.<sup>14</sup> Primary prevention of atrial fibrillation, i.e., reducing the risk of first onset by targeting modifiable risk factors, is the ultimate goal. However, this approach is challenging due to significant knowledge gaps related to understanding the multiple mechanisms of atrial fibrillation.<sup>19</sup>

Hypertension is associated with a 1.8-fold increased risk of developing new-onset atrial fibrillation and a 1.5-fold increased risk of progression to permanent atrial fibrillation.<sup>14, 20</sup> Untreated or suboptimal treatment of hypertension leads to

development of left ventricular hypertrophy, which is an independent risk factor for the development of atrial fibrillation.<sup>14, 21</sup>

In some studies, up to 90% of atrial fibrillation patients are observed to be hypertensive.<sup>22-24</sup> In a prospective study, 20 years follow-up study involving Framingham Heart Study and Offspring participants, a 20mmHg rise of pulse pressure causes 24% increased risk of atrial fibrillation.<sup>25</sup>

Once hypertension developed, it influences atrial fibrillation, even if on later stages, BP is under control. In Framingham Heart Study, significant decrease in BP with medicines did not decrease atrial fibrillation markedly in hypertensive patients. The hazard risk of atrial fibrillation in hypertensive versus non-hypertensive patients was HR=2.05 (95% CI, 1.24-3.37) if BP reduced. But HR=1.95 (95% CI, 1.08-3.49) if BP increased, over 15-year follow-up.<sup>26</sup> In our study OR of hypertensive patients with atrial fibrillation was 5.605. Among all configurations, hypertensive patients had 2 times increased risk of developing atrial fibrillation, irrespective of whether systolic blood pressure is high or low during follow-up. But no relationship was found with diastolic blood pressure. The evidence suggested that early control of blood pressure before remodeling occurs, may be crucial to avert atrial fibrillation related to hypertension.<sup>26</sup>

There is significant evidence that even pre-hypertension deliberates a high risk of atrial fibrillation development. In a study, both; systolic blood pressure  $\geq 140$ mmHg & 128-138mmHg were related to new-onset atrial fibrillation, (HR=1.84; 95% CI, 1.07-3.19) & diabetes (HR=1.98; 95% CI, 1.22-3.27).<sup>27</sup> In the Losartan Intervention for End Point Reduction in Hypertension study, there were less chances of atrial fibrillation in patients with baseline on-treatment systolic blood pressure  $\leq 130$ mmHg (HR=0.60; 95% CI, 0.45-0.82) & systolic blood pressure 131-141mmHg (HR=0.76; 95% CI, 0.62-0.93), than systolic blood pressure  $\geq 141$ mmHg.<sup>28</sup>

Because of high prevalence of atrial fibrillation in the population, arterial hypertension plays a vital role in development of atrial fibrillation and its complications.<sup>29</sup> Fibroblast explosion, gap junction remodeling, apoptosis of cardiomyocytes, accumulation of collagen in both; atrial & ventricular myocardium, all go together with age-related structural remodeling influencing electrical activity.<sup>16</sup> The presence of hypertension also motivates oxidative stress, systemic inflammation, rennin-



angio tensinal doxerone & sympathetic activation, which further initiate the remodeling progression of atrial fibrillation. Essentially, both; hypertension & atrial fibrillation autonomously raise the risk of cardiovascular & cerebrovascular events.<sup>30</sup>

## CONCLUSION:

There is a significant association of hypertension with atrial fibrillation. Thus, hypertensive patients should be screened regularly to prevent atrial fibrillation.

## Author's Contribution

AI: Consultant incharge of the study. AA: Helped in conducting the study. MSAT: Analysis of data.

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