Frequency of Cardiac Arrhythmias in Hypertensive Patients


Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC/NIHD)/National University of Medical Sciences (NUMS) Rawalpindi, Pakistan, *Hackensack Meridian Jersey Shore University Medical Center, Neptune City, United States of America, **Fauji Foundation Hospital, Rawalpindi Pakistan, ***The Children Hospital and Institute of Child Health, Lahore Pakistan, ****Army Cardiac Center, Lahore Pakistan, *****Punjab Institute of Cardiology, Lahore, Pakistan, ******Nishter Hospital, Multan, Pakistan

ABSTRACT

Objective: To determine the frequency of cardiac arrhythmias in hypertensive patients.

Study Design: Analytical Cross-sectional study.

Place and Duration of Study: Tertiary Cardiac Center, Lahore Pakistan, from Jan 2021 to Dec 2021.

Methodology: Two hundred patients (males and females), age between 20-80 years, suffering from hypertensive disease (Blood Pressure ≥140/90mmHg), one year before were assessed in the study. After that ECG was done according to International standards. Then patients undergone 24-hour Holter monitoring test. Presence of cardiac arrhythmia was confirmed by the interpretation of 12 lead ECG and 24-hour Holter report. All the data was noted. Patients with cardiac arrhythmias were treated in consultation from the Electrophysiology (EP) department of the hospital. By using the SPSS version 26, the statistical data was tabulated, analyzed and interpreted.

Results: The mean age was calculated to be 58.64±7.74 years. In this study the males were 148(74%) while 52(26%) were females. The mean duration of hypertension was found to be 5.09±1.56 years. Cardiac arrhythmias were noted in 22(11%) cases. Out of 22 cases of cardiac arrhythmias, 2(1%) patients had premature atrial contractions, 2(1%) had atrial flutter, 4(2%) had premature ventricular contractions and 14(7%) had atrial fibrillation. Cardiac arrhythmias were significantly higher in patients above 40 years of age (p<0.05). There was no difference in both genders as well as duration of hypertension has unremarkable effect on cardiac arrhythmias (p>0.05).

Conclusion: The research study concluded that in hypertensive patients, the cardiac arrhythmias frequency is low but its value is not unremarkable.

Keywords: Cardiac arrhythmias, Diabetes mellitus, Hypertension.


INTRODUCTION

Hypertension adversely affects the brain, heart, kidneys and other body organs. Even a slight increase in the systolic blood pressure leads to increased risk of cardio-vascular events or stroke.1 Hypertension is also known as “silent” killer because it lacks early diagnostic symptoms.1 About 25% of the population of the world is suffering from this silent killer and it is estimated that by the year 2025, this figure is likely to increase to 33%. The higher incidence in both developed and developing countries makes it a significant factor for high morbidity and mortality.2

The age is a very cardinal risk factor for hypertension; therefore the aging population in the Central Europe and in the North America complicates the existing health system. Its prevalence differs significantly from one region to another. The significant differences in its prevalence were because of the various elements which include the age, ethnic group, racial tribe, education level, country of origin, family wealth, BMI, and working status.3

The Ministry of National Health Services of Pakistan revealed that hypertension is currently affecting the 19% of population and 35% are aged above 40 years. The percentage of the people who are early diagnosed with hypertension is very small and this among them is getting any kind of early treatment. Hence 15% of hypertension cases were appropriately managed.4 It also depicted clearly that its prevalence in males is increased from less than 15% in 25 years old to greater than 62% in over the age of 75 years and at the same time, in females it is increasing from less than 10% at 25 years to 70% in 60-69 years age group, thus the prevalence in the female population is noted to be very high as compared to the male population.5

Hypertension has played the key role in the occurrence of cardiac arrhythmias. Arrhythmias not only put huge burden on the economy of health sector but it
Cardiac Arrhythmias in Hypertensive

also affects the patient’s life quality in several ways. In hypertensive individuals, (i) The LV diastolic dysfunction, (ii) The dilated LA, and (iii) The LV hypertrophy leads to the onset of cardiac arrhythmias. 

In addition to that the activation of neuro-hormonal pathways has also been suggested to trigger cardiac arrhythmias. The presence of cardiac arrhythmias has increased the incidence of stroke but when it coexist with hypertension then there is a manifold increase in the heart related complications.

Recently, in order to identify the hypertensive patients which have the potential for developing cardiac arrhythmias, different ECG features have been sorted out and these include (i) p wave analysis, (ii) the corrected QT interval, (iii) the variability in heart rate, (iv) the late action potentials of the ventricles and (v) the detailed morphological analysis of T-wave.

The role of anti-hypertensive drugs in causing cardiac arrhythmias is also worth mentioning. The use of anti-hypertensive drugs causes electrolytes imbalance, which results in the occurrence of atrial and ventricular arrhythmias. A multipronged management approach that involves the proper screening, the diet management, and the effective dosage of drugs can result in better control of systemic hypertension and thus it averts the occurrence of cardiac arrhythmias.

The characteristics of hypertensive heart disease are the structural changes and hypertrophy of left ventricle, with subsequently electrophysiological changes in the atrial and ventricular myocardial tissue, which results in the occurrence of various brady and tachy arrhythmias. Patients with hypertension may present to the physician with different brady-arrhythmias, and these significantly affect the patient’s clinical condition. Although the exact prevalence is not reported, brady-arrhythmias in hypertensive individuals can occur frequently and have a different etiology that includes the drug-related arrhythmias or the degenerative electrical disease of the conduction system.

The cardiac physicians avoided the combination of anti-hypertensive drugs to the maximum possible extent but if need arises then their combination should be used with extreme caution, due to the risk of onset of sinus bradycardia or atrio-ventricular (AV) block. Moreover, patients with renal disease and on anti-hypertensive treatment including beta-blockers may present with dose-dependent bradycardia, and therefore, the anti-hypertensive drugs with predominantly renal clearance, such as bisoprolol, atenolol etc should not be used.

At the National level so far no research study is conducted that has reported the frequency of cardiac arrhythmias in hypertensive patients. There are studies but these are not conducted in hospitals of Pakistan. If the study reported the high frequency of cardiac arrhythmias, then it gives direction to the physicians to evaluate all the hypertensive patients for these arrhythmias.

This research study was conducted to find out the frequency of cardiac arrhythmias in hypertensive patients.

**METHODOLOGY**

The study was conducted at cardiology department of a tertiary cardiac care center of Lahore, Pakistan, from January to December 2021, after seeking approval from ethical committee (IERB letter no. RTPGME-RESEARCH-397/PIC).

**Sample Size:** Using consecutive sampling technique (non-probability), confidence level at 95%, with 5% margin of error and 12% expected frequency of cardiac arrhythmias, calculated sample was (n=163). However, the data was collected from (n=200) patients.

**Inclusion Criteria:** Two hundred patients (males and females), age between 20-80 years, suffering from hypertension (Blood Pressure ≥140/90mmHg), one year before were assessed in the study.

**Exclusion Criteria:** Patients with cardiac congenital abnormalities, cardiac tumor, valvular heart disease, valve repair or replacement, undergone any cardiac procedure such as CABG, EP studies, Radio frequency ablation (RFA) of arrhythmias or history of blood disorders, body organ malignancy were not assessed in the study.

The patients at the time of presentation in the hospital were asked about using any anti-hypertensive drug for the control of blood pressure. After that ECG was done according to International standards. Then patients undergone 24 hour Holter monitoring test. Presence of cardiac arrhythmia was confirmed by the interpretation of 12 lead ECG and 24 hour Holter report. Then all the data was noted. Patients with cardiac arrhythmias were treated in consultation from the Electrophysiology (EP) department of the hospital. By using the SPSS version 26, the statistical data was tabulated, analyzed and interpreted. Frequency and percentages were stratified for qualitative variables like; gender, diabetes etc. Mean along with standard deviation was stratified for age, duration of hypertension etc. After tabulation and detailed stratification, the chi
Cardiac Arrhythmias in Hypertensive

The mean age was calculated to be 58.64±7.74 years. In this study the males were 148(74%) while 52(26%) were females. The M:F ratio was found to be 2.8:1. The mean duration of hypertension was found to be 5.09±1.56 years. The study found 70(35%) diabetics were noted in 22(11%) cases had no arrhythmias. Out of 22 cases of cardiac arrhythmias, 02 (1%) patients had premature atrial contractions, 02 (1%) had atrial flutter, 04 (2%) had premature ventricular contractions and 14 (14%) had atrial fibrillation. There was no patient to have any bradyarrhythmia. (Table-II & Figure).

<table>
<thead>
<tr>
<th>Types of Cardiac Arrhythmias</th>
<th>Patients (n=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature Atrial contractions</td>
<td>02 (01%)</td>
</tr>
<tr>
<td>Multifocal Atrial tachycardia</td>
<td>None</td>
</tr>
<tr>
<td>Paroxysmal SVT</td>
<td>None</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>14 (07%)</td>
</tr>
<tr>
<td>Atrial Flutter</td>
<td>02 (01%)</td>
</tr>
<tr>
<td>Accelerated Junctional tachycardia</td>
<td>None</td>
</tr>
<tr>
<td>Premature Ventricular contractions</td>
<td>04 (02%)</td>
</tr>
<tr>
<td>Ventricular tachycardia (VT)</td>
<td>None</td>
</tr>
<tr>
<td>Grand Total</td>
<td>22 (11%)</td>
</tr>
</tbody>
</table>

The data was stratified for age, gender and duration of hypertension. It appeared that in patients between 20-40 yrs of age; no cardiac arrhythmia was noticed while in patients between 41-80 years of age, 22(12%) were found to have cardiac arrhythmias. Significant difference was noted (p=0.033). It was found that 18 (12.2%) males and 4 (7.7%) females had cardiac arrhythmias. It showed insignificant difference (p= 0.376). In patients with 1-4 years history of hypertension, 8 (7.0%) patients had cardiac arrhythmias while patients with >4 years history of hypertension, 14 (16.6%) cases had cardiac arrhythmias. It depicted the insignificant difference (p=0.788) (Table-III).

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Cardiac Arrhythmias</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>20-40</td>
<td>0</td>
</tr>
<tr>
<td>41-80</td>
<td>22</td>
</tr>
</tbody>
</table>

DISCUSSION

In hypertensive patients the onset of cardiac arrhythmias have important inferences that range from atrial premature beats to atrial fibrillation, to lethal ventricular arrhythmias that leads to sudden cardiac arrest and death.11 The patho-physiology of arrhythmogenesis in hypertension involves several mechanisms that include the hemodynamic changes, neuroendocrine pathways, the myocardium remodeling etc. 12 Due to high blood pressure, the mechanical overload on the left ventricle may deactivated the ion channels or junctional complexes and thus in this way it generates the arrhythmogenic activity in the myocardial tissue.13,14

In hypertensive patients, the structural and functional changes in the left ventricle also contribute to the occurrence of lethal cardiac arrhythmias and sudden cardiac death. Early after depolarizations are suggested to be the underlying cause in the generation of these lethal cardiac arrhythmias.15 The nocturnal cardiac arrhythmias have been detected in up to 60% of patients suffering from sleep apnea, and the autonomic malfunctioning is held responsible for their occurrence. These include sinus node blocks and atrio-ventricular (AV) blocks. Sleep apnea also leads to the onset of atrial fibrillation.15,16

In the USA about 3.0 million people have atrial fibrillation and it is considered as the most common
Cardiac Arrhythmias in Hypertensive

cardiac arrhythmia in the hospitalized patients. The research studies conducted in North America, United Kingdom & Ireland reported the prevalence of atrial fibrillation 1% to 2% in the general community. The main emphasis in the management of atrial fibrillation is to prevent the occurrence of cerebro-vascular events. The oral anticoagulation therapy is offered to all atrial fibrillation patients depending upon their calculated CHA2DS2-VASc Score. In elderly hypertensive patients, the rhythm control strategy is not followed for the treatment of atrial fibrillation. It is worth mentioning here that in the elderly patients, the rate control therapy has reduced the morbidity and mortality in comparison with the rhythm control therapy, before the advent of radio frequency ablation (RFA) therapy.

In the management of hypertensive patients with SVT, the therapy solely depends on the type of SVT. The treatment of SVT is both non-pharmacological as well as pharmacological. Most of the time, they are successfully managed by non-pharmacological maneuvers such as carotid sinus massage and valsalva etc. In patients failed to respond, the drug therapy was used for their termination. The radio frequency catheter ablation therapy, has been offered to the patients as first choice for long term treatment of SVT. The patients who have turned down the catheter ablation therapy, the drug therapy are a reasonable alternative for the successful treatment of SVT.

In patients with increased mass of the left ventricle, hypertension poses an alarming threat for deadly cardiac arrhythmias. The underlying mechanism is the prolonged repolarization period as depicted by the corrected QT interval and it is linked with a higher risk of arrhythmias. Other proposed mechanisms, such as demand supply mismatch particularly during stress exercises, disrupted the coronary arteries flow and consequently myocardial ischemia develops which leads to the development of arrhythmias. The study showed direct linkage of age and gender on the prevalence and occurrence of cardiac arrhythmias. Males were more prone towards developing cardiac arrhythmias in comparison with the females of age group (<60 years) but there was no such relation after 70 years. From the study important inferences have been derived. It gives the prevalence of cardiac arrhythmias in hypertensive patients. The prevalence of cardiac arrhythmias is 11% in the hypertensive patients, which is high enough and it might cause serious complications such as thromboembolic stroke in them.

LIMITATIONS OF STUDY
The study was single center with small number of comorbid had been included. There was no patient follow-up. Further studies can be planned with longitudinal study design.

CONCLUSION
The research study concluded that in hypertensive patients, the cardiac arrhythmias frequency is low but its value is not unremarkable. Therefore, this research study recommends the hypertensive patients to undergo the periodic screening for the early detection of cardiac arrhythmias. In this way the hypertensive patients can be saved from life threatening complications.

ACKNOWLEDGMENT
We are highly obliged to the HOD and the staff of cardiology department as well as R&D department for their continuous support and guidance.

Conflict of Interest: None

Author’s Contribution
Following authors have made substantial contributions to the manuscript as under:

MNT: Manuscript writing, concept and editing
NAS: Intellectual contribution, concept and final approval
MHR: Study design, drafting the manuscript and critical review
SA: Intellectual contribution, concept and final approval
GC: Drafting the manuscript, proof reading & critical review
JA: Data collection, data analysis and review of article
NA: Analysis, manuscript writing and proof reading
AN: Review of article, formatting and critical review
SNYB: Formatting, critical review and data collection/entry
AAC: Proof reading, formatting and critical review

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES
Cardiac Arrhythmias in Hypertensive


