Open Access

Original Article

Frequency of Cardiac Arrhythmias in Hypertensive Patients

Muhammad Naeem Tariq, Naseer Ahmed Samore, Muhammad Humayoun Rashid*, Sohail Aziz, Ghoza Chaudhery***, Jahanzab Ali****, Naseem Azad, Ahmad Noeman*****, Syeda Neelam Yamin Bukhari******, Azhar Ali Chaudhry**

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 Dec2021.
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.

How to Cite This Article: *Tariq MN, Samore NA, Rashid MH, Aziz S, Chaudhery G, Ali J, Azad N, Noeman A, Bukhari SNY, Chaudhry AA. Frequency of Cardiac Arrhythmias in Hypertensive Patients. Pak Armed Forces Med J 2022; 72(Suppl-3): S477-481. DOI: https://doi.org/10.51253/pafmj.v72iSUPPL-3.9537*

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 incidencein both developed and developing countries makes it a significant factor for high morbidity and mortality.[2]

The age is a verycardinal 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 includethe 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 fraction 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 bevery high as compared to the male population.[5,6] Hypertension has played the key role in the occurrence of cardiac arrhythmias. Arrhythmias not only puta huge burden on the economy of health sector but it

Correspondence: Dr Muhammad Naeem Tariq, Adult Cardiology Department, Armed Forces Institute of Cardiology, National Institute of Heart Diseases (AFIC/NIHD), Rawalpindi, Pakistan

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 LVhypertrophy leads tothe onset of cardiac arrhythmias.[6] 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.[7,8]

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.[8]

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.[9] 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 andhave a different etiology that includes the drug-related arrhythmias or the degenerative electrical disease of the conduction system.[9]

The cardiac physicians avoided the combination of anti-hypertensive drugs to the maximum possible extent but if need arises then their combination should be usedwith 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 bradyarrhythmias, and therefore, the anti-hypertensive drugs with predominantly renal clearance, such as bisoprolol, atenolol etc should not be used.[10]

At the National level so far no research study is conducted that has reported the frequency of cardiac arrhythmiasin 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 hypertensive disease (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

square test was applied keeping the *p*–value <0.05 as significant at 95% confidence interval & 5% margin of error.

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 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 and 130(65%) non-diabetics (Table-I).

Table-I: Baseline characteristics of patients

n=200		Mean±SD/n(%)
Age (Years)		58.64±7.74
Gender	Male	148(74%)
	Female	52(26%)
Duration of hypertension (Years)		5.09±1.56
Diabetes Mellitus		70(35%)

Cardiac arrhythmias were noted in 22(11%) cases where as 178(89%) 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).

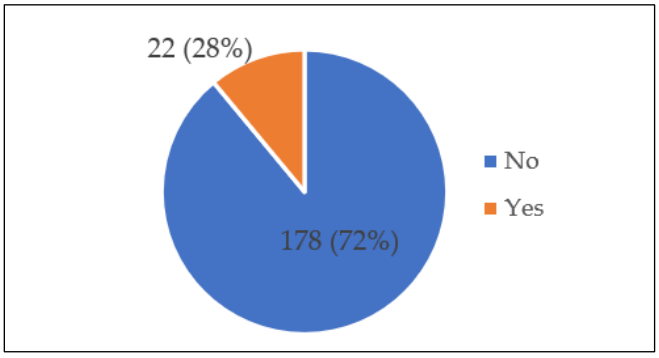

Figure: Frequency of Cardiac Arrhythmias

Table-II: Types of Cardiac Arrhythmias

Types of Cardiac Arrhythmias	Patients (n=200)
Premature Atrial contractions	02 (01%)
Multifocal Atrial tachycardia	None
Paroxysmal SVT	None
Atrial Fibrillation	14 (07%)
Atrial Flutter	02 (01%)
Accelerated Junctional tachycardia	None
Premature Ventricular contractions	04 (02%)
Ventricular tachycardia (VT)	None
Grand Total	22 (11%)

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-III: Comparison of Cardiac Arrhythmias in Different Groups

		Cardiac Arrhythmias		*p*-value
		Yes	No	
Age (years)	20-40	0 (0%)	10 (100%)	0.033
	41-80	22 (12%)	168 (88%)	
Gender	Male	18 (12.2%)	130 (87.8%)	0.376
	Female	4 (7.7%)	48 (92.3%)	
Duration of Hypertension (years)	1-4	08 (7.0%)	108 (93.0%)	0.788
	>4	14 (16.6%)	70 (84.0%)	

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 involvesseveral mechanisms that include the hemodynamic changes, neuroendocrine pathways, the myocardium remodeling etc. [12] Due to high blood pressure, the mechanical overload on the left ventriclemay 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 arrhythmia in the hospitalized patients.[17] The research studies conductedin North America, United Kingdom & Ireland reported the prevalence of atrial fibrillation 1% to 2% in the general community.[17] 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 CHA_2 DS_2-VASc Score.[18] 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.[18,19]

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.[19,20] 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.[21,22]

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.[23,24] 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.[25]

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 undergothe 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

1. Lip GYH, Coca A, Kahan T, Boriani G, Manolis AS, Olsen MH, et al. Hypertension and cardiac arrhythmias, A consensus document from the European Heart Rhythm Association (EHRA) and ESC Council on Hypertension, endorsed by the Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS) and Sociedad Latinoamericana de Estimulacion Cardiacay Electrofisiologia (SOLEACE). Euro 2018, 19(1): 891–911.
2. Williams B, Mancia G. ESC/ESH Guidelines for the Management of Arterial Hypertension, The task force for the management of arterial hypertension of the european society of cardiology the european society of hypertension. J Hypertens 2018; 36(1): 1953–2041.
3. Fialova M, Dlugosova K, Okruhlicova L, Kristek F. Adaptation of the heart to hypertension is associated with maladaptive gap junction connexin-43 remodeling. Physiol Res 2019; 57(2): 7–11.

4. Kim D, Yang PS, Kim TH, Jang E, Shin H, et al. Ideal blood pressure in patients with atrial fibrillation. J Am Coll Cardiol 2018, 72: 1233–1245.
5. Boriani G, Imberti JF, Vitolo M. The challenge to improve knowledge on the interplay between subclinical atrial fibrillation, atrial cardiomyopathy, and atrial remodeling. J Cardiovasc Electrophysiol 2021; 32: 1364–1366.
6. Aziz KU. Evolution of systemic hypertension in pakistani population. J Coll Phys Surg Pakistan 2015; 25(4): 286-291.
7. Hundemer GL, Curhan GC, Yozamp N, Wang M, Vaidya A. Incidence of atrial fibrillation and mineralocorticoid receptor activity in patients with medically and surgically treated primary aldosteronism. J Am Med Assoc Cardiol 2018; 3: 768–774.
8. Wang K, Hu J, Yang J, Song Y. Development and validation of criteria for sparing confirmatory tests in diagnosing primary aldosteronism. J Clin Endocrinol Metab 2020; 105: 282-285.
9. Pan C-T, Tsai C, Chen ZW, Chang YY, Wu VC, Hung CS, et al. Atrial Fibrillation in Primary Aldosteronism. Horm. Metab. Res 2020; 52: 357–365
10. Parcha V, Patel N, Kalra R, Kim J, Gutiérrez OM. Incidence and implications of atrial fibrillation/flutter in hyper-tension insights from the SPRINT trial. Hyperten 2020; 75(1): 1483–1490
11. Nattel S, Heijman J, Zhou L, Dobrev D. Molecular basis of atrial fibrillation pathophysiology and therapy, a translational perspective. Circ Res 2020; 127: 51–72.
12. Masin M, Gellner R, Otte B, Pavenstädt HJ, Ringelstein EB, et al. Prevalence of unknown atrial fibrillation in patients with risk factors. Europace 2017; 15(5): 657-662.
13. Nalliah CJ, Sanders P. The impact of diet and lifestyle on atrial fibrillation. Curr Cardiol Rep 2018; 20(1): 137-138.
14. Dzeshka MS, Shantsila A, Shantsila E, Lip GYH. Atrial fibrillation and hypertension. Hypertension 2017; 70: 854–861
15. Investigators AFF-uIoRM. A comparison of rate control and rhythm control in patients with atrial fibrillation. New Engl J Med 2020; 347(23): 1825-1833.
16. Afzal MR Savona S, Mohamed O, Mohamed-Osman A. Hypertension and Arrhythmias. Heart Failure Clin 2019; 15: 543–550
17. Braunwald E. Cardiovascular medicine at the turn of the millennium: triumphs, concerns, and opportunities. New Engl J Med 2021; 337(19): 1360-1369.
18. Verdecchia P, Angeli F, Reboldi G. Hypertension and atrial fibrillation. doubts and certainties from basic and clinical studies. Circ Res 2018; 122: 352–368.
19. Andelova K, Bacova BS, Sykora M, Hlivak P, Barancik M, Tribulova N. mechanisms underlying antiarrhythmic properties of cardioprotective agents impacting inflammation and oxidative stress. Int J Mol Sci 2022; 23: 1416
20. Hindricks G, Potpara T, Dagres N, Arbelo E, Bax JJ, Blomström-Lundqvist C, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J 2021; 42: 373–498.
21. Feistritzer HJ, Desch S, Zeymer U, Fuernau G, de Waha-Thiele S, Dudek D, et al. Prognostic impact of atrial fibrillation in acute myocardial infarction and cardiogenic shock. Circ Cardiovasc Interv 2019; 12: e007661
22. JebberiZ, Marazzato J, De Ponti R, Bagliani G, Leonelli FM, Boveda S. Polymorphic wide qrs complex tachycardia, differential diagnosis. Card Electrophysiol Clin 2019; 11: 333–344.
23. Marazzato J, Angeli F, De Ponti R, Di Pasquale G, Verdecchia P. Atrial fibrillation and sudden cardiac death, a mystery to unravel? GIC 2021; 22: 544–553
24. Kodani E, Inoue H, Atarashi H, Okumura K, Yamashita T, Otsuka T, et al. Impact of blood pressure visit-to-visit variability on adverse events in patients with nonvalvular atrial fibrillation, subanalysis of the J-RHYTHM Registry. J Am Heart Assoc 2021; 10: e018585
25. Cosentino F, Grant PJ, Aboyans V, Bailey CJ, Ceriello A, Delgado V, et al. ESC Scientific Document Group, 2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD, The Task Force for diabetes, pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and the European Association for the Study of Diabetes (EASD). Eur Heart J 2020; 41: 255–323.

.....