

# Frequency of Cardiac Arrest and Arrhythmias Associated with Admitted Patients in the Cardiac Care Unit in Hazara Division

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## ABSTRACT

**Objective:** The present study will determine the arrhythmias proportion associated with sudden cardiac arrest in patients admitted to cardiac care unit.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** This study was conducted at the Cardiology Department of Ayub Teaching hospital from April, 2023 to November, 2023.

**Methods:** The patients who needed cardiac resuscitation were accessed and were included in current study. We recorded initial cardiac rhythm, features of cardiac arrhythmia, demographic variables, comorbidities, and in-hospital complications till the patient's discharge. The categorical variables were presented in terms of percentages while continuous variables were presented as mean and standard deviation. Analysis of variance and chi-square was used to measure the significance which is kept less than 0.005. The data was analyzed using SPSS version 21.

**Results:** A total of 220 patients met the inclusive criteria and had SCA. The mean age of the studied sample was 65±9 years. The most common rhythm analyzed initially was VT in 32% (70) of individuals followed by PEA in 24% (53). Myocardial ischemia was found to be the most common immediate precipitating cause of arrhythmias (38%). ROSC was attained in 47% of patients, among which 58 patients survived to discharge (STD). PEA carried the worst mortality overall among cardiac arrhythmias while VT had the most favorable outcome with a proportion of 48.5% (34/70).

**Conclusion:** We concluded that shockable rhythm i.e. VT is still prevalent in developing countries like Pakistan while globally the behavior of arrhythmias has been changed to non-shockable rhythms of unknown cause. The patients among which ROSC was restored within 5-10 minutes survived to discharge with good neurological status. However, it was observed that as the time for ROSC is prolonged, the neurological outcome and survival rate declines. Overall, PEA carries the worst mortality.

**Key Words:** Cardiac care unit (CCU), shockable rhythm, cardiac arrhythmias, resuscitation, restoration of spontaneous circulation (ROSC).

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## INTRODUCTION

Rapid recognition of peri-infarction malignant arrhythmias in modern cardiac care units evolved into different terrains, where patients suffering from heterogeneous concomitant comorbidities may now be treated successfully. Globally, cardiovascular disease (CVD) is the major cause of morbidity and death<sup>1</sup>.

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From 1990 to 2019, there were approximately twice as many CVD prevalence cases (271 million) as there were fatalities due to CVD (12.1 million to 18.6 million)<sup>2</sup>. Current literature suggests that 80% of CVD cases occur in low- and middle-income countries, because of urbanization and ageing<sup>3,4</sup>. According to the study done in Khyber Pakhtunkhwa, the prevalence of cardiovascular disease (CVD) is 17.5%<sup>5</sup>.

In a developing country like Pakistan, advanced health care like Primary percutaneous coronary intervention (PCI) is a big challenge to be available in every tertiary care hospital. For this reason, pharmacological thrombolysis is the most common method used in tertiary care hospitals<sup>6</sup>. In our country, due to low socioeconomic status, the presentation of cardiac events to hospitals is delayed. According to one institutional study, the attributed symptoms of other diseases is the most common reason for delayed presentation to hospital<sup>5</sup>. The delayed presentation and underlying comorbidities subject the patient to life-threatening

cardiac arrhythmia. Delayed diagnosis and thrombolysis lead to late blood flow storage, which increases infarct size, and subjects the patient to cardiac arrhythmia. So, the majority of CVD patients— about a third died upon arrival at the hospital, so timely diagnosis and immediate interventions are necessary<sup>7</sup>. Missing thrombolytic treatment also creates a group of individuals at high risk for developing later cardiac events, such as mortality, heart attack, stroke failure, and potentially fatal arrhythmias<sup>8</sup>.

Underlying ischemic heart disease is the great victim of sudden cardiac arrest (SCA) in adults. Based on electrophysiology, the SCA can be categorized into ventricular tachycardia (VT), ventricular fibrillation (VF), asystole (ASY), and pulseless electrical activity (PEA). Studies have shown that in-hospital cardiac arrest associated with VT/VF can be survived to discharge because of shockable rhythm<sup>9</sup>. Previously it was thought that VT and VF were the most common arrhythmias associated with SCD but currently, the incidence has declined contrary to PEA/ASY— whose incidence increased for unknown reasons. Over time this change in the behavior of arrhythmias also necessitates to study of the nature and prognostic implications of cardiac arrhythmias. PEA/ASY is more prevalent and accounts for 30% of cardiac mortality and 20% of total mortality in adults<sup>10</sup>. Globally the overall survival rate from cardiac arrest is <10%<sup>11</sup>.

It's important to assess the characteristics of different type of arrhythmias and their response to intervention. With an extensive review of the literature, we have found that the objective data on acute cardiac care and arrhythmias in CCUs are still scarce, and producing evidence-based institutional guidelines remains an issue. Starting from this background we have decided to undertake this study to know the major types of arrhythmias and response to intervention. Moreover, the present study also determined the demographic characteristics, comorbidities, and underlying causes of arrhythmias. This will create reliable data that help treat CCU physicians in better understanding and prevention of arrhythmias in cardiac patients.

## METHODS

This was a prospective cross-sectional study that recruited all consecutive admissions to the cardiac care unit (CCU) of Ayub Teaching Hospital from 1<sup>st</sup> April 2023 to 30<sup>th</sup> November 2023. The institutional ethical committee approved the study with the safety of human subjects. A non-probability purposive sampling technique was applied for sample collection. The source of data collection was an online predesigned Google form, which was filled out by the healthcare professional and submitted with a special ID code.

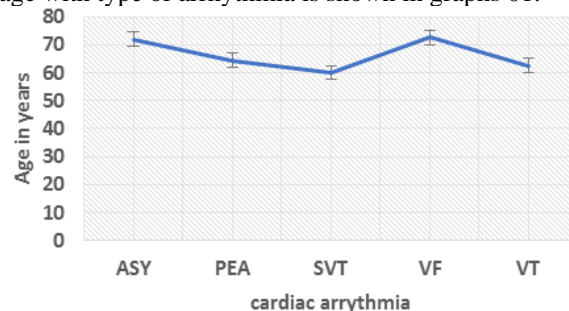
The CCU at this facility is a single 16-bed, in which all admissions are triaged, accepted, and cured by a certified cardiologist of the institution. Information

regarding cardiac arrhythmia, treatment, interventional procedure, and end event was explored from patient's files and electronic data from the Hospital management system (HMS). We categorized primary arrhythmias into seven different groups, namely ventricular fibrillation, ventricular tachycardia, pulseless electrical activity, asystole, torsade de point, supraventricular tachycardia, and unstable atrial fibrillation. We recorded the frequency and type of arrhythmias during admission. Moreover, the treatment, procedure, stay and outcome were also recorded for each patient. The primary endpoint of the study was to determine the frequency and type of arrhythmia in patients admitted to CCU. The patients with asymptomatic arrhythmia, hemodynamically stable atrial fibrillation, asymptomatic bradyarrhythmia, and diagnosed arrhythmia patients who don't need CCU care were excluded from the study.

Interquartile ranges (IQRs) and medians were used to display continuous data, while absolute numbers and percentage values were used to show categorical variables. The chi-square test was used to compare categorical variables, and the one-way analysis of variance was used to compare continuous variables. A p-value less than 0.05 was considered significant. The data was analyzed using SPSS version 21.

## RESULTS

About 350 patients were presented with arrhythmias in current study but only 220 patients met the inclusive criteria (n=220) subjects of cardiac arrest were recruited with known initial cardiac rhythm. The mean age of the sample was 65±9years. 77% sampled population was obese with a mean BMI of 34kg/m<sup>2</sup>. The relation of an age with type of arrhythmia is shown in graphs 01.



**Graph No. 1: Relation age and type of arrhythmia (p=0.000)**

Over 92% sampled population was diabetic (204/220) and only 9% (20/220) had controlled diabetes. Eighty-five percent of patients (188/220) were hypertensive and 65% had a duration greater than 5 years. The most common rhythm recorded initially on ECG was VT in 70 patients (32%) followed by, 53 PEA patients (24%), ASY49(22%), VF 40(18%), and SVT 8(4%) patients. No cases of torsade de points and unstable atrial fibrillation were recorded during the study period. The

characteristics are shown in table 1. Myocardial infarction was the most common immediate factor found for arrhythmia with frequency of 84/220(38%), followed by CCF 76(34.5%), arrhythmia with undetermined cause in 53(24%), pulmonary embolism 06(3%) and hypotension in 1 (0.4%) patient. Dilated cardiomyopathy was the most common underlying cardiac comorbidity with frequency of 74(33.6%), Ischemic cardiomyopathy 56(25.4%), valvular 50(22.7%), hypertrophic cardiomyopathy 24(11%) and

no underlying structural heart disease was found in 16(7%) of individuals. About 162 (73.6%) individuals died because of arrhythmia, 44(20%) survived with a good neurological state at hospital discharge while 14(6.3%) had poor neurological sequelae. All patients with PEA died in the hospital while 26 VT patients survived in a good conscious state at the hospital discharge detailed in Table 1. The factor which affects mortality is listed in Table 2.

**Table No. 1: Different features of cardiac arrhythmia in patients of CCU**

Characteristics	Asystole (ASY) n=49 (22%)	Pulseless Electrical activity (PEA) n=53(24%)	Supra ventricular Tachycardia (SVT)n=08(4%)	Ventricular Fibrillation (VF) n=40 (18%)	Ventricular Tachycardia (VT) n=70 (32%)	P value
Age(years)	71.9	64.5	62	70	65	0.000
BMI (Kg/m <sup>2</sup> )	34	25	38	31	34	0.003
Hypertension	45	47	09	44	47	0.005
Diabetes	Poor control	42	45	20	34	0.026
	Controlled	06	04	02	02	
	Non-diabetic	04	03	04	02	
Event location	CCU	44	52	10	38	0.003
	Ward	05	01	00	05	
	Public	00	00	03	00	
Pharmacological agent given for arrhythmia	Amiodarone	12	07	05	23	0.000
	Atropine	01	02	01	01	
	Digoxin	09	01	01	05	
	Epinephrine	02	03	01	01	
	lidocaine	01	01	01	01	
	Nor epinephrine	16	28	00	19	
	DNR	02	05	05	04	
Preexisting cardiac comorbidities	DCM	28	18	03	13	0.000
	HCM	01	03	01	09	
	ICMP	04	22	03	11	
	Valvular	16	10	01	11	
	unknown	04	02	05	00	
Electrical cardioversion	12	06	06	25	58	0.000
Discharge status	Survived with good conscious	05	00	07	05	0.000
	Survived with poor conscious	00	00	02	05	
	Died in hospital	44	53	01	35	

**Table No.2: Factors significantly affecting hospital discharge status in patients experiencing cardiac arrest**

Factors	Died in hospital 162(73%)	Survived with poor conscious status 14(6.3%)	Survived with good conscious status 44 (20%)	Total	Significance level
Diabetes	Poor controlled	140	14	30	0.001
	Good controlled	10	00	10	
	nondiabetic	12	00	04	
Hypertension	yes	138	12	38	0.017
	no	24	02	06	
Event location	CCU	148	13	40	0.03
	ward	12	1	3	

	Public places	02	00	01	03	
ASY without subsequent VT/VF		44	06	10	60	0.000
PEA without subsequent VT/VF		42	16	10	68	0.001
Underlying comorbidities	DCM	54	05	15	74	0.000
	HCM	18	1	5	24	
	ICMP	41	4	11	56	
	Valvular	37	3	10	50	
	No cause	12	1	3	16	
Return of spontaneous circulation	<5min	01	01	00	02	0.000
	5-10min	19	04	13	36	
	10-20min	19	04	19	42	
	>20min	05	05	12	22	
	Not return	118	00	00	118	
Pharmacological agent	Amiodarone	57	05	16	78	0.001
	Atropine	06	00	02	08	0.001
	Digoxin	13	01	04	18	
	Epinephrine	06	01	01	08	
	Lidocaine	03	00	01	04	
	Nor-epinephrine	61	05	16	82	
	DNR	16	02	04	22	

## DISCUSSION

We comprehensively evaluated 220 patients for cardiac arrhythmias who experienced sudden cardiac arrest either in public places, hospital wards, or CCU. Besides the high prevalence of CVD, the national literature regarding arrhythmia in CCU is still scarce.

In the present study, the mean age of sampled data who experienced sudden cardiac arrest is older than reported by Faiza Ahmed et al<sup>12</sup>. — the recent study conducted in Karachi. The reason could be the small sample size, demography, and period of the COVID-19 pandemic. Overpopulation is older than reported by Moosajee, U.S. et al<sup>13</sup> and Khan NU et al<sup>14</sup> but interestingly the mean age is near to that reported by Tseng ZH et al<sup>15</sup>. The sampled population who experienced cardiac arrest due to VF, ASY, and PEA are older than the population with VT and SVT. We observed that the frequency of VT/VF (shockable rhythm) is still higher than reported previously by Faiza Ahmed et al<sup>12</sup>. Although the global incidence of VT/VF is declining because of unknown cause<sup>11</sup>. The reason for the difference could be the hospital setting and sample size, we observed arrhythmia in CCU while Faiza Ahmed et al observed it in Medical ICU, CCU, COVID-ICU, and HDU<sup>12</sup>. Cardiac ischemia is the most common immediate factor responsible for arrhythmias and dilated cardiomyopathy is the most common preexisting cardiac comorbidity in patients who experience sudden cardiac arrest<sup>11</sup>. Contrary to Faiza Ahmed et al. respiratory insufficiency is the most common immediate factor responsible for arrhythmia and ASY is the most common initial rhythm observed in sudden cardiac arrest<sup>12</sup>. Unfortunately, over 85% of all patients who experienced SCA are diabetic, hypertensive with obesity.

ROSC was achieved in 47% of patients, and survived to discharged (STD) proportion is 24%. In comparison

with Moosajee, U.S. et al 27% ROSC was achieved and 7.5% STD. The difference in proportion is likely due to event location. In our study, 99% of patients experienced hospital SCD while in Moosajee, U.S. et al only 33% of patients experienced SCD in the hospital. It is predetermined that hospital cardiac arrest has more survival than hospital SCD<sup>12</sup>. All patients in whom the ROSC achieved less than 5 min survived, and greater than 50% in whom ROSC achieved less than 20 min survived while mortality increased after 20 min ROSC. In terms of initial rhythm vs STD, 55% VT and 18% VF (shockable rhythm) STD as compare to 12% ASY and 00% PEA (non-shockable rhythm). These findings are almost consistent as reported by Moosajee, U.S. et al<sup>13</sup>. A negligible mortality difference is noted in patients who experienced ASY vs patients who experienced ASA with subsequent VT/VF while a significant difference is noted in patients with good neurological outcomes in survived patients. A significant difference is noted in the mortality of patients who experienced PEA with subsequent VT/VF Vs only PEA. Mortality is higher in patients with only the PEA group vs the PEA with the VT/VF group which is 80% vs 61% respectively. 45% of patients STD who initially received amiodarone as initial antiarrhythmic while epinephrine was commonly antiarrhythmic reported by Moosajee, U.S. et al<sup>13</sup>. The variance could be due to a relative difference in the proportion of initial cardiac rhythm.

## CONCLUSION

The present study concluded that the patients with cardiac arrhythmia are older than previously reported at global and national levels. Over 85% sampled population have poorly controlled hypertension and diabetes. All patients encountered in CCU with arrhythmia are overweight. The incidence of VT is still

high in developing countries like Pakistan despite global decline. The most common immediate cause responsible for arrhythmia is myocardial ischemia. The proportion of ROSC was high in patients who experienced cardiac arrest inside the hospital. The survival to discharge with a good conscious state is high in patients whose ROSC is 5-10min, while mortality and poor neurological outcome drastically increased in patients with whom ROSC is  $\geq$  20min. PEA carries the worst in-hospital mortality, all patients died during management, while shockable rhythm—VT carries have favorable discharge status among all arrhythmias..

#### Author's Contribution:

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