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**Original Research Article** 

# Diagnosis And Management of Arrhythmias In COVID-19 Patients in A Tertiary Care Hospital: Outcomes and Clinical Implications

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#### Abstract

**Introduction:** In COVID-19 pandemic second wave many cardiac patients got admitted due to direct and indirect effects of COVID-19 virus infection. Some cases develop Arrhythmias either Tachy Arrhythmia or Brady Arrhythmia due to varied reasons. It is due to dehydration, volume and pressure alterations in cardiac chambers. Increased sympathetic drive due to reflex mechanisms following hypoxia is one of the main mechanisms. Tachycardia due to anxiety, hemodynamic stress leads to alteration in metabolism of cardiac smooth muscle cells. There is alternation in the electrolyte balance due to severe COVID infection. Severe pulmonary involvement will lead to release of cytokines which stimulate the cardiac conduction pathways. Cellular mechanisms being increased automatically, micro and macro re-entry. In this study, we would like to study the incidence of arrhythmias and its impact on the outcome.

**Materials And Methods:** Single centre observational study conducted in a tertiary care centre from April 2021 to March 2022,

All patients who were included under retrospective observational study, were subjected to take ECG and ECHO, CT chest, and CBC, RFT, random blood sugar, ESR, CRP and other serological markers for inflammation, and other baseline investigations. Clinical history, details regarding COVID-19 illness & its severity were obtained and ECG findings were noted before and after treatment of arrhythmias and other useful parameters like ECHO and details of COVID-19 disease treatment were all entered in a master sheet. Qualitative data obtained were analysed using Chi-Square test.

**Results:** During COVID pandemic 2<sup>nd</sup> wave, between April 2021 and March 2022, there were 18104 admissions in COVID ward. out of them, 62 cases were admitted with ACS (0.34%), 22 patients had arrhythmias,

16 Cases (73%) with tachyarrythmias,6 cases (27%) had bradyarrythmia,17(77%) were males,5(23%) cases were females.7 cases had atrial fibrillation with rapid ventricular rate, 3 had atrial tachycardia, one case of supraventricular tachycardia, one case of multifocal atrial tachycardia, one case of fascicular Ventricular tachycardia, one case with multifocal ventricular premature beats, one case of WPW syndrome. two patients had bradycardia and, junction rhythm. complete heart block,2<sup>nd</sup> degree AV block was seen in one case respectively.10 patients had diabetes mellitus,7 had hypertension,5 cases had chronic kidney disease. one patient is a known case of RHD,2 cases had coronary arty disease, one case had mitral valve prolapse. DC cardioversion was given for two cases, a case of SVT, and

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fascicular VT, Temporary pacemaker insertion done for two cases of complete heart block. Among patients who had arrhythmias 50% had mortality.

**Conclusion:** It is important to recognize that COVID -19 patients those who are critically ill and in ICU care may develop life-threatening arrhythmias that can be detected as early as possible for the appropriate management and optimal outcomes. Underlying viral myocarditis if present should be treated promptly. Primary prevention with careful monitoring of patients, who are at high risk for developing life threatening arrhythmias, plays vital role in COVID-19 patients.

Keywords: Covid-19, Second Wave, Pandemic, Tachy arrhythmias, Brady arrhythmias.

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#### Introduction:

In COVID-19 pandemic second wave many cardiac patients got admitted due to direct and indirect effects of COVID-19 virus infection. Some cases develop Arrhythmias either Tachy Arrhythmia or Brady Arrhythmia due to varied reasons. Tachy Arrhythmia may be first manifestation of severe COVID infection. Arrhythmias like Ventricular Fatal Tachycardia (VT)and Ventricular Fibrillation (VF) are reported even though the incidence is rare. Tachycardia can be Supraventricular Tachycardia (SVT) or Ventricular Tachycardia (VT) among COVID patients. Underlying structural heart disease may be the reason for developing SVT. Any sudden increase in volume or pressure overload to hemodynamic stress will initiate stretching of cardiac smooth muscle and if this continues the cell process become vulnerable for enhanced automaticity or re-entry. Underlying abnormal accessary pathways may be the reason rarely like syndrome, Ebstein Anomaly, WPW previous post operative scars for re-entry circuit formation and culminating in SVT Inarrow ORS tachy] or SVT with aberrancy [wide QRS tachy].

Brady Arrhythmias like Sinus Brady, Sick sinus and functional rhythm and AV blocks I, II and complete heart blocks. The above said Brady Arrhythmias can be due to cardiac involvement of COVID. Some may be due to underlying substrate precipitated by COVID related heightened parasympathetic activity. Remdesivir can produce Brady Cardiain 5% of cases as per available data. Drug induced Brady Arrhythmias can occur rarely due to use of negative chronotropic drugs like Betablockers, Ivabradine etc. Underlying hypothyroidism may manifest as Sinus Bradycardia. Sometimes it can be an incidental finding. Here in this article, we are going to give data of both Tachycardia and Bradycardia cases who were admitted in COVID-19 ward. We found that there was slightly higher tachy Arrhythmias in incidence of comparison with COVID wards. Overall outcome of Supraventricular Tachycardia and (SVT) was good Ventricular Tachycardia (VT)& Ventricular Fibrillation (VF) are poor.

# Materials and Methods:

It is a single centre, Observational Study from April 2021 to March 2022, All patients who were included under this study, were subjected to take ECG and ECHO, CT chest, and CBC, RFT, random blood sugar, ESR, CRP and other serological markers for inflammation, and other baseline investigations. Clinical history, details regarding COVID-19 illness & its severity were obtained, and ECG findings were noted before and after treatment of arrhythmias and other useful parameters like ECHO and details of COVID-19 disease treatment were all entered in a master sheet. Qualitative data obtained were analysed using Chi Square test.

# **Inclusion Criteria:**

- All patients who are admitted in COVID-19 ICUs and other critical care units with COVID-19 illness (RTPCR positive and clinical covid illness), comorbid illness and underlying cardiac diseases.
- All patients aged above 18 years admitted with COVID-19 illness in critical care units.

# **Exclusion Criteria:**

- All patients who have non covid illness and in patients <18 years were excluded from the study.
- All patients who were not done echocardiogram (POCUS) in covid 19 ICUs and other critical care units.

# **Results**:

All patients who were admitted in COVID-19 ICUs and critical care units were evaluated for ECG.

evidence of arrhythmias. Patients were treated according to arrhythmias diagnosed in the setting of underlying preexisting heart disease or new onset arrhythmias diagnosed in COVID-19 patients. In the context of COVID-19 and associated arrhythmias, we want to highlight the fact, appropriate treatment of tachyarrhythmias / brady arrhythmias improved outcomes in patients with no underlying severe covid illness and comorbid diseases which were associated with poor outcomes in COVID-19 patients. 22 patients had arrhythmias,16 Cases (73%) with tachyarrythmias, 6 cases (27%) had bradyarrythmia,17(77%) were males, 5(23%) cases were females (TABLE 1&2). 7 cases had atrial fibrillation with rapid ventricular rate, 3 had atrial tachycardia, one case of supraventricular tachycardia, one case of multifocal atrial tachycardia, one case of fascicular Ventricular tachycardia, one case with multifocal ventricular premature beats, one case of WPW syndrome. two

patients had bradycardia and, junction rhythm. complete heart block,2<sup>nd</sup> degree AV block was seen in one case respectively (TABLE 3,4&4). 12 patients had diabetes mellitus,7 had hypertension, 1 case had chronic kidney disease. 2 patients were a known case of RHD. 2 cases had coronary artery disease, one case had mitral valve prolapse (TABLE 7&8). DC cardioversion was given for two cases, a case of SVT, and fascicular VT, Temporary pacemaker insertion done for two cases of complete heart block (TABLE 9). Among patients who had arrhythmias 50% had mortality (TABLE 10).

New onset atrial fibrillation with fast ventricular response is the most common tachyarrhythmia noted. Most common Brady arrhythmia is sinus bradycardia. Among 7 patients with AF and rapid ventricular response, underlying RHD was present only in two cases. One case of left posterior fascicular VT reverted with DC cardio version. One case of SVT reverted with DC cardio version along with injection adenosine. Commonly used drugs for SVTs include inj. adenosine, tab metoprolol. digoxin, tab and tab amiodarone in most of the cases and tab verapamil in some cases. Complete heart block was observed in two cases for which temporary pacing done. Reversible causes like drug induced bradycardia and electrolyte disturbance were managed accordingly (TABLE 9).

# Discussion

# Arrhythmia and COVID-19:

Atrial fibrillation was the most common arrhythmia in patients with COVID-19 according to one survey. In our centre, out of 22 patients, 7 patients (39%) had atrial fibrillation and 5 patients are new onset AF, only two had underlying rheumatic heart disease. The mechanisms that cause atrial fibrillation in these groups of patients are possibly due to systemic infection, cardiomyocyte direct viral injury,

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hypoxemia, and susceptibility of the population due to advanced age and their co-morbidities, and sympathetic system over activity. Incidence of new onset AF in COVID 19 patients is little known and it has been associated with poor outcomes in critically ill patients. Atrial tachycardia was noticed in 3 patients, SVT in 2 cases, multifocal atrial tachycardia in two cases, pre-excitation pattern noticed in one patient without underlying history of palpitation. Sinus tachycardia noted in two cases.

Both atrial and ventricular tachy arrhythmias have been noticed in COVID -19 patients, without any history of arrhythmia. Out of 33 patients, 1 patient had fascicular VT and 2 patients had ventricular premature complexes (1 had ventricular bigeminy and another had ventricular trigeminy). There were reports showing VT/VF more common in patients with elevated troponin levels compared to those with normal troponin levels.

Sinus bradycardia observed in two cases and two patients diagnosed as complete heart block underwent temporary pacemaker lead insertion. 2:1 AV block noted in one patient. Junctional rhythm noticed in one patient. One case of hyperkalemia causing bradycardia, treated with correction of hyperkalemia using calcium gluconate and insulin with dextrose.

# Management for arrhythmias in COVID-19 patients

COVID-19 is associated with an increased risk of myocardial injury and myocarditis. Inflammation or injury in the atria can predispose to AF/Fl. In patients with many types of severe illness, AF/Fl in patients with COVID-19 and influenza is associated with higher mortality. Atrial fibrillation can be managed with anticoagulation therapy, oral medications like metoprolol, verapamil and digoxin. Recurrence of AF is quite common in patients with severe COVID disease.

Complete heart block has also been reported in patients with a COVID-19 infection. In these bradycardic patients, isoproterenol, an analog of epinephrine or dopamine infusion is shown to increase heart rate. Monitoring electrolyte levels and reviewing medications can also help prevent arrhythmic complications or cardiac arrest in patients with bradycardia.

Different studies show that 40% of patients who die from COVID-19 disease have cardiac involvement. Monitoring patients with SARS-CoV-2 for arrhythmias or myocardial injury can be done with serial ECGs. The ECG features of SARS-CoV-2 are not well defined especially during the initial stages of the disease. ECG changes seen are late-onset and not in parallel with pulmonary occurrence abnormalities with after negative nasopharyngeal

swabs. Echocardiography could be useful to distinguish COVID-19–related myocardial damage and primary cardiac disease and also to monitor and assess COVID-19 cardiovascular complications such as arrhythmias.

# **Conclusion:**

It is important to recognize that COVID-19 patients those who are critically ill and in ICU care may develop life-threatening arrhythmias that can be detected as early for possible the appropriate as management and optimal outcomes. Underlying viral myocarditis if present should be treated promptly. Primary prevention with careful monitoring of patients, who are at high risk for developing life threatening arrhythmias, plays vital role in COVID-19 patients.

The true prevalence of cardiac events in patients with COVID-19 may not be fully appreciated. This study highlights the cardiac arrhythmias-such as AF, AV block, POTS, and VT/VF—during and after COVID-19 infection and its impact on outcome. If properly managed in time, we can avoid death due to worsening hemodynamic status.

Furthermore, given the breadth of cardiac arrhythmias involved in COVID-19 and the diversity of their etiologies, remote monitoring and telemedicine has emerged as a growing and necessary aspect of COVID-19 management for patients with cardiac complications or at risk of cardiac complications.

With the onset of new therapeutics for COVID-19, further questions are raised as to how this will impact the management of arrhythmias. Studies will be needed to investigate the association between vaccination-status and risk of COVID-19related cardiac arrhythmias.

Limitations: Ours is a single centre study with small sample size, In hospital mortality may not represent the outcome due to covid or arrhythmia per se. Our study maynor represent the true incidence of general population because many private centres were also treating COVID-19 patients. There is no guidelines available for management of arrhythmias in structurally normal heart.

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Males were higher than females. Figure 1: Total Number Of Arrythmias



Figure 2: Age Distribution Of Arrythmias

Age Distribution Of Arrythmias, Males more affected than females, in 41 to 50 years, 61 to 80 years.



Table 3: Types of Arrythmias			
	Males	Females	Total
Tachyarrythmia	12	4	16
Bradyarrythmia	5	1	6
Total	17	5	22



Figure 4: Tachyarrythmias -Distribution Table 4: Tachyarrythmias -Distribution

	Male	Female	Total
Atrial fibrillation with Rapid ventricular response	7	0	7
Atrial tachycardia	3	0	3
SVT-AVRT	0	1	1
SVT-AVNRT	1	0	1
Multifocal atrial tachycardia	0	1	1
WPW Pattern	0	1	1
Fascicular VT	0	1	1
VPC(Trigeminy)	1	0	1



# Figure/Table 5:Bradyarrythmias –Distribution

Figure 5: Bradyarrythmias – Distribution

Tahle	5.	Brady	arrv	thmi	ыс <u>–</u> Г	)istri	hution
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		-	
	Male	Female	Total
Sinus bradycardia	2	0	2
Junctional rhythm	1	0	1
Complete heart block	2	0	2
2 <sup>nd</sup> degree AV block	1	0	1
Temporary pacemaker insertion	2	0	2

		Male	Female	Total
SWAB Test	Positive	6	1	7
	Negative	8	2	10
	Not taken	4	0	4
	Dyspnoea	12	4	16
	Clinical covid	4	2	6
Symptoms	Covid pneumonia	6	1	7
	Palpitations	3	1	4
	Fever	3	0	3
	Non covid	1	0	
	Mild	5	1	6
CT-Chest	Moderate	5	1	6
	Severe	5	0	5

#### **Table 6: COVID Conditions**

#### **Table 7: Comorbid Conditions**

	Male	Female	Total
DM	10	2	12
SHTN	5	2	7
CKD	1	0	1
PLHA on ART	1	0	1
OLD CVA	0	0	1
Metabolic encephalopathy	0	1	1
ARDS	1	0	1
Acute ischemic stroke	1	0	1
DKA	1	0	1
Rhinosinusitis	1	0	1
Old PTB	1	0	1
Invasive fungal sinusistis	1	0	1
Hypothyroidism	0	1	1
DVT	1	0	1
Parkinsons	1	0	1

# **Table 8: Cardiac Conditions (Structurally Abnormal Heart)**

	Male	Female	Total	
RHD/Severe MS/Post BMV/AF	1	0	1	
CAD	1	1	2	
MVP	1	0	1	
Table 0. Treatmont				

Table 9: Treatment					
Tachyarrythmias	No. of Patients	Bradyarythmias No. of Patients			
DC Cardioversion-	2	Temporary pacemaker	2		
SVT, Fascicular VT		implantation			
Inj.Adenosine	2	Tab.Orciprenaline	1		
Inj. Digoxin	1	Hyperkalemia correctin	1		
Beta blockers	4	Drugs stopped	2		
Tab.Amiodarone	8				
Ivabradine	1				
Tab.digoxin1					

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1 41	rabiero. reatment outcomes				
	Male	Female	Total		
Survived	7	4	11		
Death	10	1	11		
Total	17	5	22		
Mortality rate-50%					

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