

Characteristics Electrocardiogram Changes and their Outcome in Patients Presenting with Corona Virus Disease

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ABSTRACT

Objective: To assess the electrocardiographic (ECG) changes and their outcome during hospitalization of COVID-19 patients, not yet been comprehensively studied before.

Study Design: Cross sectional study for 6 months.

Place and Duration: Department of medicine, cardiology in POF hospital Wah Cantt from 16th March to 15th September 2020.

Materials and Methods: Patients who are diagnosed case of corona virus disease confirmed by COVID 19 PCR test were included in this study. There was no age and gender discrimination. Patients of any age (children, Adolescent, adults and old age) either gender were included in this study. Data of about 100 patients was collected. Non probability consecutive sampling technique was used. Then nasopharyngeal swab sample was taken for COVID-19 PCR testing. The report was collected from the laboratory. ECG was done in order to look for characteristic changes. Outcome was measured in terms of 30 days mortality.

Results: 100 patients presenting with corona virus disease were enrolled. The mean age of study patients was 46 ± 24 years ranging from 20 to 80 years. 70 % of male & 30 % of female. Death rate in male is 10% and female is 20%. 64% study patients having age more than 50 years, 36% patients having age less than 50 years. Highest death rate occurred in old age group. Patients with ESRD and COPD are more prone to death due to COVID-19 infection.

Conclusions: Corona Virus disease is associated with different types of ECG abnormalities and associated with high mortality rate.

Keywords: COVID-19, Electrocardiography, Outcome

INTRODUCTION

Corona virus disease is an acute illness that involves respiratory system (upper and lower) most of the times. Virus belongs to corona family. It comprises vast family of viruses, including 43 types of viruses but only 7 types causing disease in human beings. Corona virus disease for the first time appeared in December 2019 in Wuhan province China and spread all over the world.⁴ WHO has declared Corona virus disease as a global pandemic on March 11, 2020.⁵ In Pakistan first case of corona virus disease is reported on March 27, 2020. Up till now there are around 200,000 cases reported in Pakistan. Out of these 6230 deaths has been reported.⁶ The overall incidence of corona virus disease all over the world in around 24.4 million and 800,000 people died of this disease till August 28.⁷ In the United States, 5.8 million cases of COVID-19 have been confirmed till August 28, 2020 and 180,000 deaths.⁸

The major route of transmission is through respiratory droplets, respiratory secretions, saliva and through aerosol particles.⁹ No vertical transmission.¹⁰

This disease is equally distributed in children adults and old ages, however mortality rate is higher in old people, immuno-compromised patients, patients with renal failure, hepatic failure, and heart failure.¹¹

Corona virus disease is characterized by release of cytokines. These cytokines further activate micro phages with the lung parenchyma; this phase is followed by immune dis-regulation.¹² Corona virus has an incubation

period of 3-14 days that may extend to 24 to 30 days.¹³ The presenting features of disease are cough 49% fever 41%, shortness of breath 29%, tachycardia 42%¹⁴ and diarrhea 9%. Most of the patients presented with low oxygen saturation > 92% at the time of hospitalization.¹⁵ Covid-19 infection is prevented by social distancing, use of sanitizers, proper hand washing and using face masks.¹⁶

Following are the indicator of sever corona virus disease: Respiratory rate more than 30 breaths/min, high grade fever for 3 to 5 days, poor mental state, unexplained metabolic acidosis, chest x-ray showing multiple infiltrates in lungs, plural effusion and consolidation.¹⁷ The rate of hospitalization in confirmed corona virus cases is 14%, ICU admission: 2% and mortality: 5%.¹⁸

Cardiac involvement is not uncommon in patients with corona virus disease. Myocarditis and cardiomyopathies are the common manifestations. Common ECG changes are cardiac arrest 1.3%, atrial fibrillation 3.5%, bradyarrhythmias 1.3% and 1.4% nonsustained VT,^{19,20} an ST-Segment Elevation in 2% patients²¹, left ventricular hypertrophy 33%, atrial fibrillation 26% and NSTEMI 3.9%.²¹

Corona virus disease can be detected by PCR. The sensitivity and specificity of PCR is 30-40% throat swab, 65% in Nasal swab. Many patients have elevated CRP, raised ESR and D-dimers.²²

MATERIAL AND METHOD

It was a cross sectional study. Sample size is calculated by using WHO (world health organization) sample size

calculator where confidence level = 95%, Absolute precision 2.5%, Prevalence of COVID-19 disease. 4.7 %. Sample size 100 patients.

This study was conducted at department of medicine, cardiology in POF hospital Wah Cantt that is a tertiary care hospital. Duration was from 16th March to 15th September 2020 for 6 months. Non probability consecutive sampling was done. Patients of both sex and age 20-80 years, diagnosed case of COVID-19 disease presented with cough, fever and shortness of breath were included. Patients with prior history Chronic Liver disease,

Patients taking medications causing characteristic ECG changes were excluded.

After telling the patients about the purpose of the study and taking informed consent, nasopharyngeal swab samples of all patients with documented COVID 19 symptoms were taken and sent to pathology laboratory of our hospital. PCR test for COVID-19 by ELISA kit method was performed. The report was collected by the studying doctor. The report was written on specifically designed proforma. ECG of all COVID-19 confirmed patients was done. ECG changes of patients were written on proforma. If the patients had severe ECG changes, patients were admitted in the hospital CCU and treated accordingly. The outcome was measured in terms of 30 days mortality.

Data was analysed by using SPSS 26). Mean and standard deviation were used for quantitative variables such as age. Frequency and percentages were used for qualitative variables such as gender, and ECG changes.

RESULTS

In our study gender distribution of patients is 70% of male & 30% female. Death rate in male is 10%. However death rate in females is 20%, the overall Death rate is 13%. Table 1 & 2. Age distribution in our study is 36 patients had age below 50 years and 64 had age above 50 years. Highest death rate in old age group. Table 1 & 3. According to co-morbidities, patients with ESRD and COPD are more prone to death. Table 4.

Table 1: Baseline characteristics of patients (n = 100)

Age (years)	Mean ± SD Range (min-max)	% age
	46 ± 24 20 - 80	
Age categories (years)		
20-30	10	10%
31-40	08	8%
41-50	18	18%
51-60	28	28%
61-70	20	20%
>70	16	16%
Gender		
Male	70	70%
Female	30	30%

Table 2. Study outcome according to gender distribution (n = 100)

Category	No of Patients	No of Deaths	% age of Patients
Male	70	07	10 %
Female	30	06	20 %
Total	100	13	13 %

Table 3. Outcome according to age (n = 100)

Age of patients	No of patients	No of Deaths	% age of patients
20-30	10	0	
31-40	08	01	12.5%
41-50	18	01	5.5%
51-60	28	02	7.1%
61-70	20	04	10%
>70	16	05	31.2%

Table 4. Outcome according to Co-morbidities. (n = 100)

Diseases	No of patients	No of Deaths	% age of patients
COPD	08	02	25 %
HTN	47	0	0 %
DM	36	02	6.30 %
ESRD	07	04	57 %
CCF	02	02	100 %
CAD	15	01	6.6 %
CVA/Cancer	02	01	50 %
Obesity	01	01	100 %

Table 5. ECG changes and Outcome (n = 100)

Diseases	No of patients	No of Deaths	% age of patients
1 st AVB	01	0	0 %
LBBB	07	03	43 %
RBBB	36	0	0 %
LVH	07	02	29%
LAD	09	02	22 %
RAD	15	0	0 %
Prolong QT	02	01	50 %
ACS	01	01	100 %
RVH	11	0	0
Atrial Arrhythmias	04	01	25%
Ventricular Arrhythmias	07	03	43%

DISCUSSION

The prevalence of arrhythmias and conduction system disease in patients with COVID-19 varies from person to person. There is large number of reason to develop ECG changes in patients with COVID-19 disease. Hypoxia and electrolyte abnormalities are known to be frequently reported in the acute phase of severe COVID-19 illness.²³ In a study by **Chung** and his colleagues showed that, 10 patients (7.3%) were presented with palpitations. COVID-19-related arrhythmias were reported in 44% patients.²⁴ In our study, 3 out of 7 (43%) had ventricular arrhythmias, 1 out of 4 (25%) had atrial arrhythmias. A case reported by **Boi et al.** and his colleagues, a 66-year female, diagnosed COVID-19 by PCR test. The ECG showed sinus rhythm with a first-degree atrioventricular block (AVB), sinus tachycardia with SITIIIQIII, Mobitz type I AVB and atrioventricular junctional escape beat were seen.²⁵ In our study, 01 patients had 1st AVB, No patient had sinus tachycardia with SITIIIQIII.

However the majority of patients presenting with a systemic illness consistent with COVID-19 will not have any symptoms or signs. 6.1% had prolonged QTc >500 ms,²⁶ 7% had atrial arrhythmias. 5.9% had ventricular tachyarrhythmias. In our study, 43% had ventricular arrhythmias, 25% had atrial arrhythmias and 50% patients had Prolong QT interval. **Richardson et al.** from the Lombardi region of Italy showed 60% patients died of

cardiac arrest during 2020 COVID-19 pandemic however no cardiac arrest found in our study. Many factors contributing it stress due to pandemic, or delayed treatment.²⁶

In a single-center U.S. study of 700 patients with COVID-19, **Chorin et al.** 1.3% had cardiac arrest, 1 patient had a torsades de pointes, NO cardiac arrest and torsade pontis in our study, 25 patients had atrial fibrillation however 1 patient in our study, and 10 had VT comparing to 3 in our study.¹⁹ **Fan et al.** showed that patients with severe pneumonia due to COVID-19, 90% had asystole, pulseless electrical activity was found in 4%. 13% survival to 30 days.²⁷ NO cardiac arrest and pulseless activity was found in our study.

The basic and advanced cardiac life support to COVID-19 patients should be given with standard guidelines. To deal with the suspected or confirmed COVID-19 patients the care giving person should wear the appropriate PPE before entering the room: gown, gloves, eye protection, and a respirator (eg, an N95 respirator,²⁸ facemasks are an acceptable alternative).²⁹ Acute cardiac injury (defined as abnormal troponin level) occurs in up to 20% of patients hospitalized for COVID-19 with acute myocardial infarction, 100% patients had high troponin P and Troponin I levels and are the marker of poor prognosis.³⁰

A study done by **Baldi et al.** and his colleagues showed that, 30% of patients had ST-T abnormalities vs our study 100%, 33% had left ventricular hypertrophy, 26% of patients had atrial fibrillation similar to our study 25%. 1 patient pulmonary embolism, no patients had pulmonary embolism in our study.³¹

CONCLUSION

Corona Virus disease is associated with different types of ECG abnormalities and associated with high mortality rate.

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