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ELECTROCARDIOGRAPHIC FINDINGS IN POST COVID-19 SUBJECTS

Physiology

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ABSTRACT

Background: COVID-19 is caused by novel coronavirus SARS-CoV-2. Although lung is major organ involved, it can also cause myocarditis in many patients recovering from COVID-19. Objectives of the study is to record ECG in subjects recovered from COVID-19 and to compare selected ECG parameters between asymptomatic and symptomatic post COVID-19 subjects. Study design is Cross sectional study between asymptomatic and symptomatic groups of COVID-19 infection. Study variables:HR, RR interval, ST segment and T-wave amplitude. Results: Result of this study showed quantitatively small differences in the mean value of ECG parameters but does not show significant changes statistically. No ST elevation or depression are found in the present study. Conclusion: It is recommended to use ECG as a valuable diagnostic and prognostic tool for cardiac evaluation of patients recovered from COVID-19.

KEYWORDS

Post-Covid-19, Cardiac abnormalities, Electrocardiogram

INTRODUCTION

COVID-19 is caused by novel coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Although lung is major organ involved, it can also cause myocarditis in many patients recovering from covid-19. Many post covid-19 patients are apprehensive of having developed heart disease following various cardiopulmonary symptoms they used to experienced from time to time. Our goal is to explore the sustained impact of COVID-19 focusing on the cardiac involvement in the recovered patients. Cardiac electrophysiologic changes seen in COVID-19 provide an early marker for subsequent clinical course and death and may help in initial triage of infected patients.

Cardiac abnormalities in post-COVID-19 can be detected using ECG data. The ECG is an easy tool to identify patients with acute or chronic cardiac disease through various abnormal findings, including ST-segment and T wave changes, electrical conduction disorders and tachyarrhythmias. The ECG changes reflect cardiac involvement with diverse manifestations. Arrhythmia and conduction defects are found to be more prevalent among SARS-CoV-2-infected individuals.

Objectives

1. To record ECG in subjects recovered from COVID-19
2. To compare selected ECG parameters (R-R, HR, ST segment, and T wave) between asymptomatic and symptomatic in post COVID-19subjects

MATERIALS AND METHODS

1. **Study Design:** Cross sectional study
2. **Study Settings:** Department of Physiology, RIMS, Imphal
3. **Study Duration:** Sep 2022 - Jan 2023

Study Population :

1. COVID-19 survivors of Imphal-East &Imphal-West who turned negative by RT PCR/TrueNAT/RAT
2. Who are declared recovered after 15 days of isolation according to WHO interim guidance

Study Groups

1. 30 Asymptopmatic
2. 30 Symptomatic

Inclusion Criteria:

COVID-19 survivors of age between 18 to 60 years of both sexes irrespective of race, religion or ethnicity

Exclusion Criteria:

1. Patients with existing previous cardiac co-morbidities
2. Patients on medication that can alter cardiac function

Sample Size: 60

Sampling: Patients diagnosed with COVID-19 by RT PCR/TruNAT/RAT in Manipur are recruited from RIMS, JNIMS, Covid Care Centre and also from home isolation as subjects by accessing the registers of the establishments with due permission. Subject to be participated were communicated through telephonic conversation or by visiting to their address. After being tested negative or who are tested negative by RT PCR/TrueNAT/RAT or who are declared as recovered after 15 days of isolation according to WHO interim guidance[14]. They were asked about their willingness to participate in the study after duly explaining the procedure. The willing participants were given appointment at the RIMS for the study.

Study Tools

1. 12 leads ECG (Cardiart 108T-DIGI, BPL)
2. Proforma: vital data recording

Study Variables

1. HR (bpm)
2. R-R interval
3. ST segment
4. T-wave

ECG Recording:

1. After taking consent of subject
2. Complete relaxation for a minimum of 10 minutes prior recording

Ethical Approval

- Study was done with approval of Ethics Board, RIMS, Imphal

Operational Definition

Asymptomatic	Symptomatics		
Test positive for SARS-CoV-2 but who have no symptoms that are consistent with COVID-19	Mild	Moderate	Severe
	Various signs and symptoms of COVID-19 (e.g., fever, cough, sore throat, headache, muscle pain, nausea, loss of taste and smell) Do not have shortness of breath, or abnormal chest imaging	Evidence of lower respiratory disease during clinical assessment or imaging and who have an oxygen saturation (SpO2) ≥94% on room air at sea level	SpO2 <94% on room air at sea level, a ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO2/FiO2) <300 mm Hg, a respiratory rate >30 breaths/min, or lung infiltrates >50%

Statistical Analysis

1. Data analysed using IBM SPSS statistics version 26
2. Unpaired students t-test to find significant difference of ECG data between means of ECG parameters noted between symptomatic and asymptomatic groups
3. P value of < 0.05 taken as statistically significant

Observations:

Table 1: Participants Profile

Independent variables	Group	Number	Percentage
Age groups	Younger (18-40)	24	40%
	Older(41-60)	36	60%
Sex	Male	34	56%
	Female	26	43%
Severity	Asymptomatic	30	50%
	Mild	30	50%

Table 2: Study Variables : Dependent Variables

Variables	Asymptomatic Mean±SD	Symptomatic Mean±SD	P - value	Level of significance
R-R interval (sec)	0.76±0.15	0.78±0.16	0.14	Not significant
HR (bpm)	80.05 ±12.4	81.2±12.36	0.38	Not significant
ST segment (sec)	0.076±0.011	0.08±0.0112	0.14	Not significant
T-wave (amp)	0.225±0.1019	0.207±0.0892	0.28	Not significant

In this study, no significant difference in selected ECG parameters in between asymptomatic and symptomatic post COVID-19 subjects.

DISCUSSION

Present study done to explore any cardiac involvement exists in post covid-19 subjects and detect ECG abnormalities, if any which may be diagnostic as a complication of COVID-19 infection. Both symptomatic and asymptomatic COVID-19 are associated with an increased risk of cardiovascular events. Myocarditis may be present in groups with asymptomatic and symptomatic COVID-19 subjects. ECG abnormalities in COVID-19 may be due to cytokine storm, hypoxic injury, electrolyte abnormalities, plaque rupture, coronary spasm, microthrombi, or direct endothelial or myocardial injury.In our study, 30 asymptopmatic diagnosed with COVID-19 subjects recovered from COVID-19 in the range of 18 to 65 years of age were recruited and compared with the equal number of age matched 30 symptopmatic post COVID-19 subjects.

In the similar study conducted by Mohammad HosseinNikooet al.(2022) reported ST-T wave changes in COVID-19 patients – myocarditis. Indicates disturbances in conduction system associated with COVID-19 related myocardial injury (ischemic or inflammatory). Present study found dysarrhythmias in 3 out of 60 post COVID -19 subjects. Studies of Mi Zhou et al detected cardiac abnormalities in COVID-19 survivors with most common abnormality was sinus bradycardia which appeared to be self-limiting and gradually resolved over time. Present study found low T-wave in 2 out of 60 which is similar to findings of study conducted by Mi Zhou et al (2020) that suggestive of myocardial injury in early stage with biochemical evidences. Present study found no significant changes in ST segment which is similar to findings of study by Thiago A Larenjeira et al (2020).

CONCLUSION

The finding of insignificant difference in all the selected ECGparameters among post COVID-19 patients who had mild or moderate symptoms or no symptoms can be important tool for allaying apprehensiveness of development of long term cardiac complications. Further studies are necessary with more sample size to confirm increased CV risk that can be suggested from symptoms in post COVID-19 subjects.

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