Trends in electrocardiographic and cardiovascular manifestations of patients hospitalized with COVID-19

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INTRODUCTION

- Early in the coronavirus disease 2019 (COVID-19) pandemic, a low incidence of cardiovascular complications was reported amongst hospitalised patients with COVID-19 in Singapore
- Little was known about the trend of cardiovascular complications as the pandemic progressed
- As such, we sought to examine the evolving trends in electrocardiographic and cardiovascular manifestations in patients hospitalised for COVID-19 infection.

METHOD

Patient recruitment

- Consecutive patients (n=1781) with PCR-confirmed COVID-19 were examined
- Admitted to tertiary hospital for clinical management and evaluation

Data collection

- Demographic data including age, sex, past medical history
- Clinical presentation including symptoms, vital signs, laboratory findings obtained within 24h of admission, and baseline ECG
- Adverse composite clinical outcomes were defined as either mortality, intensive care management

Statistical analysis

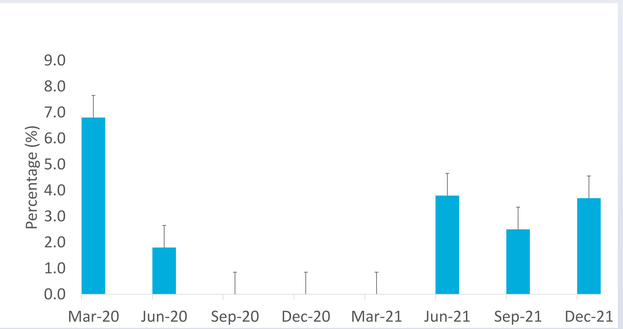
- Independent samples Student's t-tests and chi-squared tests were employed to compare between groups
- P-value of <0.05 was considered significant

RESULTS

Parameter	Overall population (n=1781)	Abnormal ECG (n=261)	Normal ECG (n=1520)	p-value
Age (years)	42.1 (±14.6)	40.4 (±16.0)	42.4 (±14.4)	0.053
Sex (male)	1426 (80.2%)	221 (85.7%)	1205 (79.3%)	0.018
Body mass index (kg/m^2)	25.8 (±5.4)	25.1 (±5.1)	26.0 (±5.4)	0.318
Smoking history	130 (7.7%)	20 (7.9%)	110 (7.6%)	0.858
Hypertension	254 (14.3%)	37 (14.2%)	217 (14.3%)	0.966
Hyperlipidaemia	173 (9.7%)	31 (11.9%)	142 (9.3%)	0.201
Diabetes mellitus	130 (7.3%)	17 (6.5%)	113 (7.4%)	0.597
Prior history of atrial fibrillation	12 (0.7%)	9 (3.4%)	3 (0.2%)	<0.001
Ischaemic heart disease	51 (2.9%)	8 (3.1%)	43 (2.8%)	0.833
Previous stroke	14 (0.8%)	5 (1.9%)	9 (0.6%)	0.042
No past medical history	1399 (78.6%)	206 (78.9%)	1193 (78.5%)	0.873
Received at least one dose of COVID-19 vaccination	273 (15.3%)	25 (9.6%)	248 (16.3%)	0.005
Received at least two doses of COVID-19 vaccination	230 (13.0%)	22 (8.4%)	208 (13.7%)	0.009
Shortness of breath	83 (4.7%)	19 (7.3%)	64 (4.2%)	0.030
Palpitations	9 (0.5%)	5 (1.9%)	4 (0.3%)	0.005
Chest pain	77 (4.3%)	18 (6.9%)	59 (3.9%)	0.032
Syncope	7 (0.4%)	1 (0.4%)	6 (0.4%)	0.978
Acute respiratory symptoms	1166 (65.5%)	157 (60.2%)	1009 (66.4%)	0.051
Asymptomatic illness	307 (17.2%)	35 (13.4%)	272 (17.9%)	0.077
Haemoglobin concentration (g/dL)	14.5 (±1.7)	14.7 (±1.8)	14.5 (±1.7)	0.042
Troponin I	41.6 (±264.3)	97.0 (±482.9)	19.7 (±68.4)	0.047
Serum C-reactive protein (μmol/L)	14.9 (±29.7)	20.1 (±50.7)	13.9 (±24.1)	0.003
Serum ferritin (μg/L)	209.1 (±295.1)	226.5 (±300.5)	205.9 (±294.1)	0.319
Lactate dehydrogenase (U/L)	420.0 (±262.2)	444.0 (±373.8)	415.9 (±237.5)	0.121
Length of hospital stay (days)	7.7 (±8.8)	9.3 (±10.1)	7.4 (±8.6)	0.036
Pneumonia	285 (16.0%)	39 (14.9%)	246 (16.2%)	0.613
Requiring intensive care	55 (3.1%)	10 (3.8%)	45 (3.0%)	0.452
Acute myocardial infarction	5 (0.3%)	3 (1.1%)	2 (0.1%)	0.025
Stroke	5 (0.3%)	1 (0.4%)	4 (0.3%)	0.548
Myocarditis	12 (0.7%)	5 (1.9%)	7 (0.5%)	0.021
Pulmonary embolism	10 (0.6%)	5 (1.9%)	5 (0.3%)	0.009
Mortality	13 (0.7%)	3 (1.1%)	10 (0.7%)	0.421

Parameter	Abnormal ECG (n=261)
Rhythm	
Normal sinus rhythm	21 (8.0%)
Sinus bradycardia	99 (37.9%)
Sinus tachycardia	123 (47.1%)
Sinus arrhythmia	8 (3.1%)
Atrial fibrillation	10 (3.8%)
ST-Segment changes	
ST elevation	13 (5.0%)
ST depression	13 (5.0%)
Left ventricular hypertrophy (by voltage criteria)	9 (3.4%)

Subgroup analysis of patients with abnormal ECG



Changes in % of COVID-19 patients with cardiovascular events over time

DISCUSSION AND CONCLUSION

- The 261 (14.7%) patients with abnormal ECG were more likely to be symptomatic with breathlessness, palpitations and chest pain
- Abnormal ECG was also associated with higher CRP, Troponin I levels
- Over time, there was a trend towards a higher proportion of hospitalised patients with cardiovascular complications

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