

CHAPTER 1

INTRODUCTION

1.1. Background

For the past 2 years, our world has been struggling with the COVID-19 pandemic. Since its first outbreak in 2019, the SARS CoV-2 virus has greatly affected many aspects of life. According to the World Health Organization (WHO), as of May 2022, there has been more than 500 million reported cases and 6 million deaths. The clinical presentations and complications of COVID-19 varied, depending on the patient's age, gender, immune status, and comorbidities (Azer, 2020).

The most common clinical presentations and classical symptoms of patients who are tested positive for COVID-19 include headache, fatigue, dry cough, sore throat, diarrhea, nausea, and anosmia. However, in some cases where hospitalization and intensive care is required, COVID-19 positive patients are presented with severe clinical manifestations such as ARDS, pneumonia, thrombotic complications, and cardiovascular complications (Kenny and Mallon, 2020).

The disturbances and effects of the SARS CoV-2 virus on ACE2 pathways, cytokine release syndrome, plaque destabilization, and increased coagulative state may induce cardiovascular complications in patients with COVID-19. As the ACE2 pathway is disrupted, the angiotensin-2 is overstimulated and results in myocardial fibrosis and hypertension which eventually leads to cardiac failure. The plaque destabilization and increased prothrombotic state on the other hand would increase the risk of

microthrombi formation, which would cause infarctions in multiple organs, including the heart (Petrovic et al., 2020). In fact, these cardiovascular complications may be more severe in patients with pre-existing cardiovascular associated comorbidities, such as hypertension.

Myocardial injury is one of the most common complications in COVID-19 patients due to the previously mentioned pathophysiology. The risk of microthrombi formation and plaque destabilization in COVID-19 patients would significantly result in myocardial infarction, indicated by ST-elevation in ECG findings (Kang et al., 2020).

However, recent studies suggest that ST-changes in COVID-19 positive patients, may not also be associated with obstructive coronary artery disease (CAD), but instead known as STEMI mimics, indicating pericarditis, myocarditis, microvascular thrombosis, or thromboembolism associated with COVID-19 presented with significantly more diffuse ST-segment elevation on ECG (Diaz-Arocutipa, 2021). The most likely etiology to the non-existent occlusion in these patients are microthrombi and somehow consistent to type 2 myocardial infarction due to the mismatch of myocardial oxygen supply (Saririan et al., 2020).

According to a recently conducted study, ST depression and ST-T changes are observed mainly in the more severe group. The ST changes in COVID-19 patients may suggest the presence of cardiac involvement and high probability of cardiac injury, thus may serve as independent predictor of prognostic factors in COVID-19 patients (Barman et al., 2021). A study suggests a 30% mortality rate of in-hospital COVID-19 patients who are presented with STEMI (Diaz-Arocutipa, 2021). With everything considered,

STEMI findings in COVID-19 positive patients have a considerably worse prognosis and higher mortality rate.

Viewing the correlation between ST changes and possible prognostic factors in COVID-19 patients, the study is therefore pivotal to increase the prediction accuracy of prognosis and mortality of COVID-19 patients who are presented with cardiovascular complications, ST changes in particular during hospital admission.

1.2. Formulation of the Problem

1. Are the ST depression findings in ECG associated with mortality in COVID-19 patients?
2. Is the type of ST depression associated with the mortality rate in COVID-19 patients?
3. Are ST elevation findings in ECG associated with mortality in COVID-19 patients?
4. Is the location of ST changes in ECG associated with mortality in COVID-19 patients?

1.3. Aim of Research

1.3.1. General aim

The purpose of this study is to find the correlation between ST changes findings in ECG with the mortality rate of COVID-19 patients.

1.3.2. Specific aim

1. To identify the association of ST depression findings in ECG with the mortality in COVID-19 patients.

2. To identify the association of ST depression types with the mortality rate in COVID-19 patients.
3. To identify the association of ST elevation findings in ECG with the mortality in COVID-19 patients.
4. To identify the association of ST changes location with the mortality rate of COVID-19 patients.

1.4. Benefit of Research

1.4.1. Theoretical benefit

Provide knowledge regarding how the type and location of ST changes affect the mortality of COVID-19 patients.

1.4.2. Practical benefit

Through the understanding of how the type and location of ST changes affect the mortality of COVID-19 patients, cardiovascular interventions may be accelerated and therefore resulting in better prognosis of COVID-19 patients.