

I. INTRODUCTION

According to WHO more than 17.9 million people died because of cardiovascular disease in 2019 alone, making cardiovascular disease the leading cause of death in the world ("Cardiovascular diseases (CVDs)", 2022). In Indonesia, more than 4.2 million people suffered from cardiovascular disease in 2018 alone (Riset Kesehatan Dasar Nasional (Raskedas), 2018). Early recognition and detection of cardiovascular disease is crucial in saving the patient's life. Symptoms such as excessive fatigue, nausea, and arrhythmia could signal a cardiovascular disease and may need clinician evaluation (Santos & Joles, 2012).

One of these early symptoms are arrhythmia, a condition where there is an unusual rhythm or rate in the heartbeat, and one of the common types of arrhythmia is premature atrial contraction (PAC) (Ribeiro, Yamada, Grupi, Silva & Mansur, 2018). In a normal condition, PAC is considered benign and does not possess any harm to the patients. However, PAC could be a precursor of more serious heart problems like atrial fibrillation (Durmaz et al., 2019).

PACs are atrioventricular contractions produced by the atrial myocardium but not caused by the sinoatrial node (SA node). Atrial premature complexes (APCs), premature supraventricular complexes (PSVCs), premature supraventricular beat, and premature atrial beat are all terms that are used to describe PACs (Heaton & Yandrapalli, 2022). Medical disorders, structural anomalies, medications, and unregulated chemicals can all contribute to this condition (Himmelreich et al., 2018). In the absence of structural cardiac illness, idiopathic PACs typically arise in the pulmonary veins. Premature atrial contractions can be classified as structural, chemical, or as a complication of another ailment (Heaton & Yandrapalli, 2022).

Structural cause of PAC include vascular disease, hypertrophic cardiomyopathy, aneurysms of the left atrial appendage, left ventricular hypertrophy, valvular heart disease, septal abnormalities, and congenital heart malformations; and the all are examples of congenital heart malformations (Ramsdale, Arumugam, Singh, Pearson & Charles, 1987). The chemicals that may cause PACs include beta-agonists, digoxin, chemotherapeutic medicines, tricyclic antidepressants, sympathomimetic amines, and monoamine oxidase inhibitors (Czaja et al., 2018). Although PAC is normally considered as benign and not harmful for the patients, a frequent PAC could be a sign of a more serious cardiovascular disease such as, atrial fibrillation, myocardial infarctions, congestive heart failure, hypertension, diabetes mellitus, and chronic obstructive pulmonary disease (Durmaz et al., 2019).

Electrocardiography (ECG) tests can perform an early detection of life threatening conditions caused by cardiovascular diseases (Bansal & Joshi, 2018). An ECG algorithm to detect PAC has been established and could be easily distinguished from other types of arrhythmia. However a long term beat annotation ECG recording is very time consuming and can only be done by specialized professionals in a hospital or advanced health care facilities (García-Isla, Mainardi & Corino, 2021). And yet, during the Covid-19 pandemic, hospitals and

other health facilities have become the treatment center for Covid-19 patients which then discouraged many people from paying a visit for their ECG monitoring.

In the absence of traditional ECG devices, advances in sensor technology have made it feasible to capture electric impulses from the heart. Many of these devices are wearable and have the ability to capture cardiac impulses for long periods of time (Haberman et al., 2015). These wearable ECG could be used outside of health facilities and easily employed to record the heartbeat. A portable ECG can be used everywhere and at any time, helping the patient to monitor their health while at the same time doing their normal regular daily activity. This way, the patient does not need to visit health facilities for monitoring.

This research aimed to developed a detection algorithm, capable of detecting premature atrial contraction in a ECG recordings. The developed algorithm then could be later integrated to a ecg detection algorithm capable of detecting different type of arrhythmia. The detection algorithm could be programed for the development of the portable ECG.