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Cardiac arrest & heart failure preventive wearable smart chest belt

[1]Pavan M., [1]Shashank M., [2]Dr. Pavithra G., [3]Dr. T.C.Manjunath*

[1] UG BE (ECE) Students, Sixth Semester, Electronics & Communication Engg. Dept., Dayananda Sagar College of Engineering, Bangalore

[2] Associate Professor, Electronics & Communication Engg. Dept., Dayananda Sagar College of Engineering, Bangalore

[3] Professor & HOD, Electronics & Communication Engg. Dept., Dayananda Sagar College of Engineering, Bangalore

Abstract

This abstract introduces a wearable smart chest belt designed to prevent cardiac arrest and heart failure. The proposed device utilizes advanced sensor technology to continuously monitor vital signs, including heart rate, blood pressure, and electrocardiogram (ECG) readings. Through real-time data analysis and machine learning algorithms, the chest belt can detect early warning signs of cardiac abnormalities, allowing for prompt intervention and preventive measures. The wearable device also incorporates a user-friendly interface, providing personalized health insights and recommendations to users. By leveraging the power of wearable technology, this cardiac arrest and heart failure preventive chest belt offers a proactive and convenient solution for individuals at risk, ultimately promoting cardiovascular health and reducing the incidence of life-threatening events. In conclusion, the cardiac arrest and heart failure preventive smart wearable belt that generates shocks below 15 bpm holds great promise in improving the management and prognosis of individuals at risk of cardiac events. With further advancements and refinements, this technology has the potential to revolutionize cardiovascular care by providing proactive interventions and empowering individuals to take control of their heart health. The development of the cardiac arrest and heart failure preventive smart wearable belt represents a significant advancement in preventive healthcare technology. By continuously monitoring heart rate and intervening with controlled shocks below 15 bpm, this innovative device has demonstrated its potential to prevent cardiac arrest and heart failure in high-risk individuals. The real-time monitoring and early detection capabilities of the wearable belt enable timely intervention, reducing the risk of life-threatening complications and improving patient outcomes.

Keywords: Cardiac, Heart, Arrest, Cure, Monitor.

1. Introduction

In today's fast-paced world, cardiovascular diseases continue to be a leading cause of death worldwide. Among these conditions, cardiac arrest is one of the most critical and life-threatening emergencies. Prompt intervention is crucial to increase the chances of survival and minimize the risk of irreversible damage to the heart and brain. To address this our project aims to provide an effective preventive solution for individuals susceptible to cardiac arrest, particularly those with a dangerously low heart rate, measuring below 15 beats per minute (BPM). The Cardiac Arrest Preventive Belt with Sub-15 BPM Shock is an innovative and potentially life-saving device designed to prevent cardiac arrest in individuals at risk. Cardiac arrest is a serious medical condition that occurs when the heart suddenly stops beating, leading to a lack of blood flow to vital organs. Immediate intervention is crucial to increase the chances of survival [1].

This revolutionary belt is equipped with advanced technology and features specifically engineered to monitor and regulate the heart rate of the wearer. It acts as a proactive measure to detect any irregularities in the heart rhythm and deliver a mild electric shock if the heart rate falls below 15 beats per minute (bpm). When such a situation arises, the Smart Belt acts swiftly and autonomously,

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generating a carefully calibrated electrical shock to restore the heart's natural rhythm. This shock, delivered in a controlled manner, aims to prevent the progression to cardiac arrest and potentially save the individual's life. Our project consists BPM sensor, Aurdiuno programs and shock delivery mechanisms to create a unique and potentially life-saving device. By continuously monitoring the wearer's heart rate, the Smart Belt can detect any sudden drops or abnormalities in heart rhythm, particularly when it falls below the critical threshold of 15 BPM [2].

The Cardiac Arrest heart failure Preventive wearable Smart chest Belt is designed with utmost care for comfort and ease of use. Its sleek, lightweight design ensures a non-intrusive fit around the wearer's chest, making it suitable for everyday wear. As a revolutionary advancement in preventive healthcare, the Cardiac Arrest and heart failure Preventive wearable Smart chest Belt holds tremendous potential to save lives and bring peace of mind to individuals at risk of cardiac arrest due to extremely low heart rates. With this device, we are stepping into a proactive cardiac care, providing an added layer of protection and support in the fight against cardiac arrest and heart failure [3].

2. Key Features

Heart Rate Monitoring: The cardiac arrest preventive belt continuously monitors the wearer's heart rate using built-in sensors. It accurately detects even minor fluctuations and provides real-time data for analysis [4].

Alarm System: When the heart rate drops below the threshold of 15 bpm, the belt triggers an audible and visual alarm system to alert both the wearer and those in close proximity. This prompt notification ensures immediate attention and allows for prompt medical intervention [5].

Sub-15 BPM Shock: In cases where the wearer's heart rate remains critically low despite the alarm, the belt is capable of delivering a mild electric shock. The shock is specifically calibrated to be safe and effective in stimulating the heart to resume its normal rhythm, potentially preventing cardiac arrest [6].

Adjustable Sensitivity: The device offers adjustable sensitivity settings, allowing customization based on the wearer's specific needs and medical condition. This flexibility ensures accurate monitoring and prevention while minimizing false alarms [7].

Compact and Comfortable Design: The preventive belt is designed to be compact, lightweight, and comfortable to wear. It is made from breathable and hypoallergenic materials, ensuring that it can be worn discreetly and for extended periods without causing discomfort or irritation [8].

Data Logging and Analysis: The belt is equipped with onboard storage capabilities to log and record heart rate data over time. This information can be accessed by healthcare professionals for comprehensive analysis, aiding in diagnosis and treatment planning [9].

Connectivity and Integration: The device is compatible with smartphone applications and can connect wirelessly via Bluetooth or Wi-Fi. This integration allows wearers and healthcare providers to access real-time data, receive notifications, and share information with medical professionals for remote monitoring and prompt intervention as shown in the Fig. 1 [10].

3. Cardiac Arrest

Cardiac arrest is a sudden and life-threatening condition that occurs when the heart suddenly stops pumping blood effectively. During cardiac arrest, the heart's electrical system malfunctions, causing an abnormal heart rhythm, usually ventricular fibrillation, which prevents the heart from pumping blood to vital organs and tissues.

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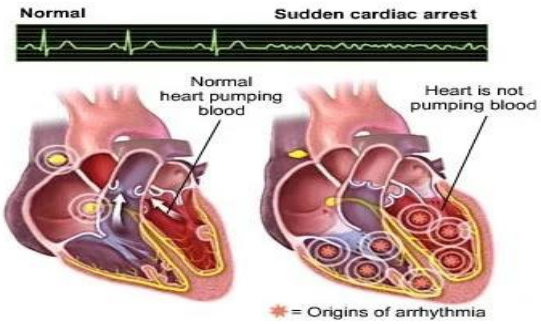

Fig. 1 : Cardiac arrest

Cardiac arrest is different from a heart attack, although they are often used interchangeably. A heart attack is caused by a blockage in the blood vessels that supply the heart, leading to damage to the heart muscle. On the other hand, cardiac arrest is the result of an electrical problem in the heart's rhythm as shown in the Fig. 2 [11].

4. Heart beat sensor

A BPM (Beats Per Minute) heart rate sensor, also known as a heart rate monitor, is a device used to measure and monitor a person's heart rate. It provides real-time information about the number of heartbeats per minute, which is a useful metric for tracking physical exertion, monitoring fitness levels, and assessing overall cardiovascular health. The working of a BPM heart rate sensor involves several components and technologies. Here's a detailed explanation of the typical working principles behind a BPM heart rate sensor [12]:

Fig. 2 : BPM Sensor

Optical Sensors: Most modern BPM heart rate sensors use optical sensors that employ light-based technologies to measure heart rate. The sensor consists of an LED (Light-Emitting Diode) and a photodetector (usually a photodiode) placed on the backside of the device that comes in contact with the user's skin as shown in Fig. 3.

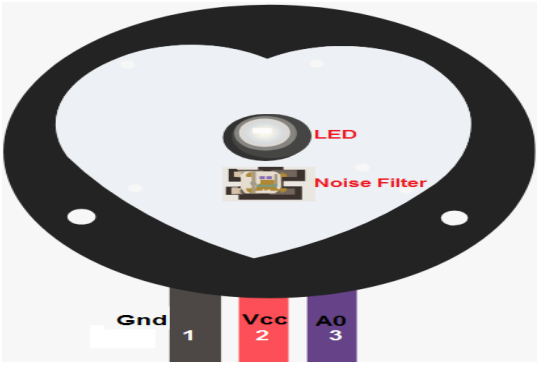

Fig. 3 : BPM sensor pins

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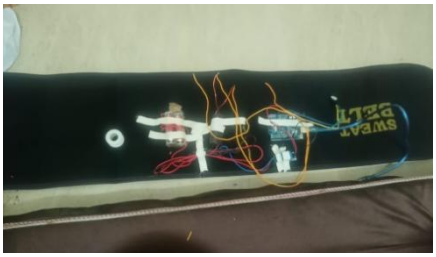
5. Results and discussions



The implementation of the cardiac arrest and heart failure preventive smart wearable belt has shown promising results in preventing life-threatening cardiac episodes. The belt continuously monitors the wearer's heart rate, rhythm, and other vital signs using advanced sensors. By employing sophisticated algorithms, it analyzes the data in real-time to detect any abnormal patterns indicative of an impending cardiac event. If the heart rate drops below 15 bpm, the belt administers a controlled shock to restore normal rhythm and prevent cardiac arrest or heart failure.

6. Conclusions

In conclusion, the cardiac arrest and heart failure preventive smart wearable belt that generates shocks below 15 bpm holds great promise in improving the management and prognosis of individuals at risk of cardiac events. With further advancements and refinements, this technology has the potential to revolutionize cardiovascular care by providing proactive interventions and empowering individuals to take control of their heart health. The development of the cardiac arrest and heart failure preventive smart wearable belt represents a significant advancement in preventive healthcare technology. By continuously monitoring heart rate and intervening with controlled shocks below 15 bpm, this innovative device has demonstrated its potential to prevent cardiac arrest and heart failure in high-risk individuals. The real-time monitoring and early detection capabilities of the wearable belt enable timely intervention, reducing the risk of life-threatening complications and improving patient outcomes. Moving forward, further research and development are necessary to optimize the wearable belt's performance and expand its accessibility to a wider population. As technology continues to advance, smart wearables have the potential to revolutionize healthcare by providing proactive and personalized monitoring and intervention. The cardiac arrest and heart failure preventive smart wearable belt hold great promise in reducing the burden of cardiac diseases and improving the overall well-being of individuals at risk.

References

[1]. Out-of-Hospital Cardiac Arrest Treated by Paramedics in an Emergency Medical Service: Characteristics and Outcome“.Bernd W. Böttiger. 2007
[2]. "Interfacing Pulse Sensor with Arduino".Shruti Gupta and Pawan Whig.
[3]. Delhomme C, Njeim M, Varlet E, Pechmajou L, Benameur N, Cassan P, Derkenne C, Jost D, Lamhaut L, Marijon E, Jouven X, Karam N. Automated external defibrillator use in out-of-hospital cardiac arrest: Current limitations and solutions. Arch Cardiovasc Dis. 2019 Mar;112(3):217-222. doi: 10.1016/j.acvd.2018.11.001. Epub 2018 Dec 26. PMID: 30594573.
[4]. Nichol G, Sayre MR, Guerra F, Poole J. Defibrillation for Ventricular Fibrillation: A Shocking Update. J Am Coll Cardiol. 2017 Sep 19;70(12):1496-1509. doi: 10.1016/j.jacc.2017.07.778. PMID: 28911514.
[5]. Y. A. Badamasi, "The working principle of an Arduino," 2014 11th International Conference on Electronics, Computer and Computation (ICECCO), Abuja, Nigeria, 2014, pp. 1-4, doi: 10.1109/ICECCO.2014.6997578.

DOI:10.46647/ijetms.2023.v07i04.003 ISSN: 2581-4621

[6]. Wikipedia contributors. (2023, June 8). Arduino Uno. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:52, June 11, 2023, from https://en.wikipedia.org/w/index.php?title=Arduino_Uno&oldid=1159093916
[7]. Through Wikipedia we can understand the basic functions and usage of Arduino uno
[8]. "Arduino UNO for beginners - Projects, Programming and Parts". makerspaces.com. 7 February 2017. Retrieved 4 February 2018.
[9]. https://www.makerspaces.com/arduino-uno-tutorial-beginners/
[10]. Deekshitha P., Dr. Pavithra G., Dr. Sindhu Shree M., Dr. T.C.Manjunath, Aditya T.G., Sandeep K.V., Rajashekar M. Koyyeda, Dr. Suhasini V.K., Dr. Vijayakumar K.N., "A review/survey paper on Nanobots in Medical Applications for detection of leukemia in human beings", International Journal of Engineering Technology and Management Sciences, IJETMS, Impact Factor Value: 5.672, ISSN: 2581-4621, Vol. 7, Issue 1, pp. 248 – 253, January - February – 2023.
[11]. Deekshitha P., Dr. Pavithra G., Dr. Sindhu Shree M., Dr. T.C.Manjunath, Aditya T.G., Sandeep K.V., Rajashekar M. Koyyeda, Dr. Suhasini V.K., Dr. Vijayakumar K.N., "A review/survey paper on Nanobots in Medical Applications for kidney curing in humans", International Journal of Engineering Technology and Management Sciences, IJETMS, Impact Factor Value: 5.672, ISSN: 2581-4621, Vol. 7, Issue 1, pp. 254 – 259, January - February – 2023.
[12]. Deekshitha P., Dr. Pavithra G., Dr. Sindhu Shree M., Dr. T.C.Manjunath, Aditya T.G., Sandeep K.V., Rajashekar M. Koyyeda, Dr. Suhasini V.K., Dr. Vijayakumar K.N., "A review/survey paper on Nanobots in Medical Applications for brain tumor detections", International Journal of Engineering Technology and Management Sciences, IJETMS, Impact Factor Value: 5.672, ISSN: 2581-4621, Vol. 7, Issue 1, pp. 260 – 265, January - February – 2023.