**Community Clinic Management System (CCMS)**

[ECG Data Processing, Analysis, Heart Condition Predefine, Solution]

A Project Report

Submitted to the department of Computer Science and Engineering

In partial fulfillment of the requirements for the

Bachelor of Science in Computer Science and Engineering (CSE)

**Submitted By**

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**Supervised** **By**

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# Letter of Transmittal

4 August 2020

To,

Mr. Obaidur Rahman,

Chairman

Department of Computer Science & Engineering,

European University of Bangladesh,

2/4 Gabtoli, Mirpur,Dhaka – 1216.

Subject: Submission of Project Report on “**Community Clinic Management System**”.

Dear Sir,

It is our great pleasure to submit the project on “**Community Clinic Management System”** which has been assigned as a mandatory requirement for the completion of the BSC program. We have tried our best to give this report a presentable shape and make appropriate and informative to accomplish the objectives of the study.

We would like to convey our gratitude to you for giving me the opportunity to work on such a topic which is very much relevant to our study. We sincerely believe that the practical knowledge and experience gathered from the study will be very much helpful in our future life for doing this type of project report.

Sincerely,

|  |  |
| --- | --- |
| Md. Golam Habib | ID#160221001 |
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Department of Computer Science & Engineering,

European University of Bangladesh.

# Declaration of Student’s

Declaration of Student's We are, hereby declared that the presented report of Project named "**Community Clinic Management System**" is prepared by us.

We also confirm that the report is only prepared to meet my academic requirement not for any other purpose. This Project work has not been previously submitted for any degree at this university. I have quoted from the work of others; the source is always given. With the exception of such quotations, this project is entire my own work.

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# Declaration of Supervisor's



**EUROPEAN UNIVERSITY OF BANGLADESH**



**To Whom It May Concern**

This is to certify that the project report on " **Community Clinic Management System** " For the degree Bachelor of Science in Computer Science and Engineering from European University of Bangladesh carried out by **Md. Golam Habib** Student ID# 160221001, Md. Ashikur Rahman Student ID# 160221005, Nazrul Islam Student ID# 160222014, Md. Masum BillahStudent ID# 160222006, under our supervision.

As far as we are concern, no part of the project report has been submitted for any degree diploma, title or recognition before.

……………………………

**Md. Obaidur Rahman  
Chairman  
Department of Computer Science and Engineering  
European University of Bangladesh**



# Acknowledgement

At the very beginning, we would like to convey our sincere appreciation to the Almighty Allah for giving us the strength and ability to complete the task within the specified time.

Any project report is the product of numerous people whose efforts, ideas and suggestions make the writer's job manageable. We are indebted to many people and organization for their assistance in making this project report a reality.

We are very much thankful to our honorable supervisor, Md. Obaidur Rahman, Chairman, Department of Computer Science and Engineering, for his kind perseverance and contributions. Without his constant supervision and valuable advices and suggestions, we would not be able to complete the whole thing in a right manner.

As always, any errors or omissions are the sole responsibilities of the writers. Any suggestions improving the quality of this project report are welcome.

# Executive Summery

In Bangladesh, since 2009, establishment of 14 000 community clinics (CCs) for every 6000 population across the country brings health care to the community doorstep ([WHO](http://origin.searo.who.int/mediacentre/events/community-clinic-bangladesh-story.pdf)). Now people can avail of health, family planning and nutrition services under one roof and within half-an-hour walking distance from their homes, even in remote areas.

CCs have contributed significantly to the improvement of the overall antenatal and postnatal care in Bangladesh. The clinics provide counseling on reproductive health and consequences of early marriage, and also supply contraceptives as well as care for pregnant women. Treatment is also provided for diarrhea, pneumonia and other childhood infections.

People’s participation is an important element of CCs. Local community members actively participate in their management.

The Health and Population Sector Programme (1998-2003) aimed to bring important changes to health and family planning services in Bangladesh. The introduction of a sector wide approach brought a series of changes in the planning, financing and delivery of services. A key component was the development of the new Essential Services Package (ESP) to meet the needs of the poor, especially in rural areas and particularly women and children. Village level facilities were to be developed as a focus for the provision of ESP. These Community Clinics were to bring family planning, preventive health services and limited curative services closer to the population, and to improve the efficiency of service provision, partly by replacing outreach services with services provided from a fixed point. Community Clinics (CC) were to provide services for around 6000 people, and it was envisaged that their location would make them accessible for 80% of the population within less than 30 minutes walking distance. The design was to be simple – two rooms with drinking water and lavatory facilities, and a covered waiting area. Funds for building the clinics were provided centrally, but communities had to donate land. This was designed to increase the feeling of ownership of the developments. In a similar way each community was required to set up a group to support and assist with the management of the CC, although the staff and supplies were provided by the government. Each clinic should have two staff, one health assistant and one family welfare assistant. There is a specified allocation of equipment and a range of drugs necessary to deliver the ESP services. Staff from the CCs would continue to provide a limited range of outreach services, especially in the early period after opening, and staff from higher levels in the system would visit on a regular basis to provide additional services and to supervise the CC staff. The development included a training programed for CC staff.

In this Particular Situation we think that, we should create a system where all the facilities of the Community Clinics would be centralize and can create some inexpensive device to detect the problem of various organ of our human body. From this thought we created an inexpensive device for analyze Heart beats by ECG signals. Which is very much cheap more than other heart related device. In this regard we also create a Management system where all of the data will be created and store with a structured way. The main purpose of our project will give the luxury to explore improved services for patients. It can be used to promote basic nursing care in the hospital environment by improving the quality of care and patient safety. Rural area of Bangladesh is lack behind from the proper patient monitoring system. So, remote monitoring and guidance awareness by sharing information in an authenticated manner are the main objectives.

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# Chapter 01

## Introduction

The world population is increasing tremendously. Keeping in mind the progress of digital Bangladesh, our main objective is to digitize the community clinics of Bangladesh through IoT and work towards reducing the extra cost. The cities accommodating more population face astounding pressure of urban living. Even though the medical resources and facilities in cities are expanded daily, still the suffice level is not attained. The massive pressure towards the management of community clinic in cities has triggered the advancement in technologies to come out with the proper solutions to the booming problems. With the increased rate of medically challenged people, remote healthcare has become a part of our life. Our project aims to develop new innovations for the use of basic nursing care. In this paper, we introduce a secure IoT-based healthcare monitoring system. To achieve system efficiency simultaneously and robustness of transmission within public IoT-based communication networks, we will utilize robust crypto-primitives to construct two communication mechanisms for ensuring transmission confidentiality. By implementing nursing system will get a new dimension and every patient can be monitored remotely. By this on the basis of derived data if a patient is in critical situation, an immediate instruction can be given to the one who is in charge. It may play a vital role to reduce labor cost, rather will be easy to assess from anywhere anytime and will be helpful to take immediate decision. Thus nursing system will be digitalized. In day to day life, people are affected by various serious and complex diseases like, Cardio Vascular Diseases, Hypertension, Heart rate/pulse etc. Thus nursing system will be digitalized. In day to day life, people are affected by various serious and complex diseases like, Cardio Vascular Diseases, Hypertension, Heart rate/pulse etc. which are highly sensitive diseases. So, people are continuously anxious about their health condition. They need to consult with doctors, according with reports and checkup all of that. Internet of Things (IoT) is a growing present concept which has an effect of many aspect of human life. Various processes of different concepts including data acquisition, data transmission and data analytics enables IoT- based system to support smart solutions especially for health care. In recent years, we observe the increased interest in wearable sensors and such devices are available in market for cheaper rate for personal healthcare and activity awareness. In- IoT based system, the work progress depends on 3 system which are sensor work, get away and cloud. Firstly, talk about sensor network which is the first step for monitoring patients as well as data collection. Secondly, the gateway system which is a continuous connection networks between sensors and cloud system. The death rate of 55.3 million people dying each year or 1,51,600 people dying each day or 6316 people dying each hour is a big issue for all over the world. So, we are proposing a model where patient can measure Heart Beat rate and ECG by himself or herself and that report immediately sent to the doctors. Later that, those reports will used to consult with doctors within very short time. It is also reduce valuable time for both patients and doctors. They don’t need to wait for the reports because sensors are giving real time data.

Researches considered implementation of such advanced devices for the medical applications for data recording, management and also to continuously monitor the patient’s health.

The Internet of Things offers a rising technology to attain the next level of health services. It assures for the affordable, low-cost, reliable and handy devices to be carried or embedded with the patients, so that to enable seamless networking between the patients, medical devices and physicians. The sensors will record signals in a continuous manner, they are then correlated with the essential physiological parameters and communicated over the wireless network. The resulting data is stored, processed and analyzed with the existing health records. Using the available data records and decision support systems, the physician can do a better prognosis so that to suggest early treatment. Even when machines can also be able to come out with the medicines from the systematic study of the medicinal databases. The progressive technology will have a transformative impact in every human’s life and health monitoring; it will remarkably cut down the healthcare expenses and a step ahead in the accuracy of disease predictions. The model is very effective for rural areas people. Through IoT technologies data or patient report is sending to the doctors with time and date. IOT patient monitoring has 3 sensors. The first one is a temperature sensor, the second is the Heartbeat sensor and the third one is humidity sensor. This project is very useful since the doctor can monitor patient health parameters just by visiting a website or URL. And nowadays many IOT apps are also being developed. So now the doctor or family members can monitor or track the patient’s health through the Android apps. To operate

To operate IOT based health monitoring system project, you need a WiFi connection. The microcontroller or the Arduino board connects to the Wi-Fi network using a Wi-Fi module. This project will not work without a working WiFi network. You can create a WiFi zone using a WiFi module or you can even create a WiFi zone using Hotspot on your smartphone. The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. For example in this project, we have sent data after every 30 seconds. The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. For example in this project, we have sent data after every 30 seconds. This proposed project can use any type of persons like he or she affected with a disease or not. So, they can check it in regular basis because people pay 13 more attention towards prevention and early recognition of disease. Here, all reports will be recorded with real time. IoT devices produce large amount of data and information. These health care services are getting better and less costly by recoding and collecting patients monitoring. We are going to create such a system that collects data from the patient's body through various sensors, sends it to the cloud first and then cloud sends it to the web and to various devices like mobile, iPad etc. We will also arrange different type of training for every community clinic's nurses so that they can adapt themselves to this system. In this paper, we present idea of a service model in technological and economic views for the comfort of patients and also the open challenges in implementing IoT in real world medical field.

## Motivation

In rural hospitals, the facilities for health caring are limited. The poor quality of health management enables issues in health care system Everyone should get the knowledge of own health as easy and early as possible. Also it should be worth for each. The progression of the advance technology has constantly intrigued us. Moreover, we additionally found that there are not critical examines on computerization technology for hospital IoT based Patient Monitoring System. Along these, we began to search the published paper and advancements around us. In present time, medical science is improving and enhancing day by day. On this creating technique people advancing more sophisticate, for example, brilliant belt which find persistent breath and additionally electro dermal movement (EDA) sensors to successively show for physiology indications of seizures during the evening. Patient monitoring system is much accessible, painless and smooth for the patient. Recently grew innovative devices executed in patient's body to reestablish ordinary activities. Sometimes it is quite difficult to know about health condition of patient for doctor and nurse. For this, they cannot give the proper treatment and instant result to the patient. Now it is very important to build up a system which can help doctor and nurse to maintain patient monitoring. Our entire system is already in the process of incorporating Internet of Things into this continuum and is expected to change the prevailing concepts in healthcare.

## Overview

Our system will be beneficial to all age of people especially for the old aged patient. It will measure the Heartbeat and ECG of the patient and upload the result in the text message, web server and mobile apps. Therefore, we have developed website as well as mobile apps in which people can get access and see the output by searching date and time. Moreover, in case of emergency, nurse or patient‘s relative check out patient’s condition by using LIVE monitor option. Our goal was to build up a system with high accuracy with minimum cost so that anyone can use and afford this.

## Objective

We know that Bangladesh government it’s have established 14000 community clinics, our ambition is to make these community clinics together an IoT based monitoring system and providing a better services to rural health complexes so that they can provide the right service the poor people of our country.

### Easy to Use

It will be a very handy tool as it shows all the data collection and information by using just only the internet. So, it reduces the workloads and stress of the relatives of the patient who work outsides.

### Better Patient Experience

For being connected to the health care system through IoT, doctors can improve the diagnosis accuracy as they are getting all the necessary patient data at hand. In a word, we can say that it allows monitoring patient continuously and remotely.

### Alert doctors and relatives

Through IoT, doctors and relatives can do their individual job without any hesitation as they can monitor the patient’s health condition from anywhere. Moreover, it will send alerts whenever a particular health parameter goes beyond the ideal limit. Furthermore, by receiving alert by doctors and relatives can take necessary action. Lastly, we can say that it saves lives in case of emergency.

### Giving a quality life for old aged people

Most of the people at their old age, like to stay at home with their dear ones rather than visiting or passing time in hospitals. But hue to hectic lifestyle people are suffering from many diseases at their early age and the older people become very weak. Additionally, this project will be beneficial to ICU patient.

### Provide an accurate detection

By using this system, we can get approximate result based on patient health. Moreover, it will be less error, collect data in less time and more accuracy than any human performances.

### Reduce costs

When a patient gets health service at home on a real time basis, there is no need for unnecessary doctor or nursing visit. In particular, this project helps to cut down cost for hospital stays and readmissions.

### Shows the outcome of the treatment

By accessing patients health data in real time information helps to make decision for the doctor on how the treatment is going on and what should do next. Over all, this project will enable the physicians to utilize the results from data collection and analyze that data in real time.

### Non expensive

This project total cost will be less expensive than any other machines which are used in the hospitals. Moreover, it is compact, lightweight and easy to use.

### Bridging the gap between doctor and patient

Health care is all about the patient so the need of the patient always comes first but it is a matter of fact that most of the patient feel uncomfortable to go to hospital or visit doctor’s chamber. In this way, this system creates a communication between patient and doctor by providing the data.

# Chapter 02

## Literature Review

## **2.1 Overview**

Vital signs derive its significance from the fact that they can be considered as an indication of the person’s health. Any change in the measurements of these signs indicates an abnormality in the physical condition of the patient. A considerable number of medical conditions can be detected from variations in one or more of the vital sign. The specialized devices for measuring the vital signs are not portable and can’t be found anywhere. Hence, in this thesis, the concept of using an arm band (potable heart rate monitor) and mobile phone as a diagnosing tool.

There are four vital signs which are standard in most medical settings:

1. Pulse rate.
2. Respiratory rate.
3. Blood pressure.
4. Body temperature.

## **Human Body**

## **Heart Anatomy**

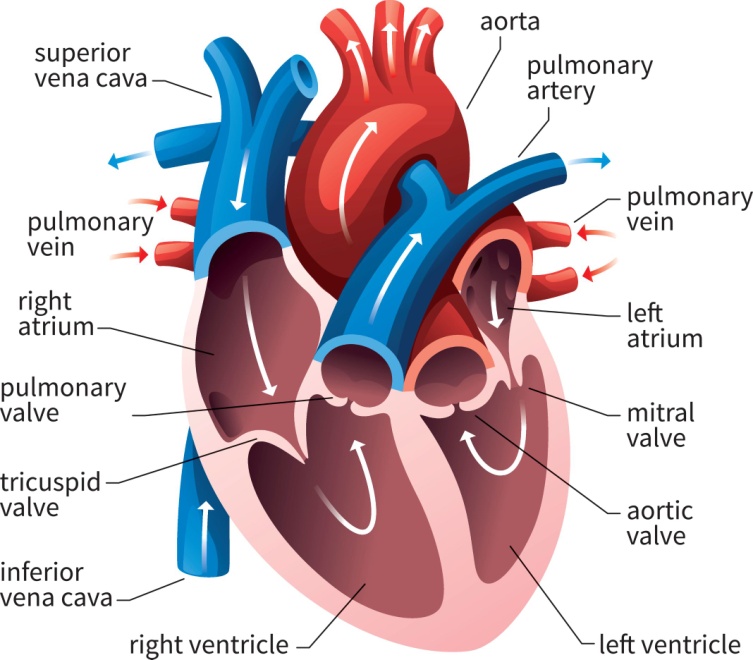
The human heart is an organ that pumps blood throughout the body via the circulatory system, supplying oxygen and nutrients to the tissues and removing carbon dioxide and other wastes.

The heart has five surfaces: base (posterior), diaphragmatic (inferior), stern costal (anterior), and left and right pulmonary surfaces. It also has several margins: right, left, superior, and inferior:

* The right margin is the small section of the right atrium that extends between the superior and inferior vena cava.
* The left margin is formed by the left ventricle and left auricle.
* The superior margin in the anterior view is formed by both atria and their auricles.
* The Inferior margin is marked by the right ventricle.

Inside, the heart is divided into four heart chambers: two atria (right and left) and two ventricles

(Right and left).



The right atrium and ventricle receive deoxygenated blood from systemic veins and pump it to the lungs, while the left atrium and ventricle receive oxygenated blood from the lungs and pump it to the systemic vessels which distribute it throughout the body.

The left and right sides of the heart are separated by the interatrial and interventricular septa which are continuous with each other. Furthermore, the atria are separated from the ventricles by the atrioventricular septa. Blood flows from the atria into the ventricles through the atrioventricular orifices (right and left)–openings in the atrioventricular septa. These openings are periodically shut and open by the heart valves, depending on the phase of the heart cycle.

Although there are a lot of structures in the heart diagrams, you shall not worry, we’ve got them all covered for you in these articles and video tutorials. Be sure to check out our specially designed heart anatomy quiz which will help you to master the heart anatomy.

## Heart Rate

HR is the rate at which the heart beats and affected by the expansion of the arterial wall with each every beat. The most prominent areas for the pulses are wrist (Radial artery), neck (Carotid- artery), inside of the elbow (Brachial artery), behind the knee (Popliteal artery) and ankle joint (Posterior artery).

The HR changes according to age and the physical and psychological impacts on the body. Higher pulse rate indicates the presence of abnormality in the body which can also be caused by other reasons such as anxiety, anger, excitement, emotion, and heart disorders. The pulse rate of an individual can help in determining various problems within the body, but it cannot be used lone to diagnose an abnormality.

The average heart rate is about 72 bpm for sedentary males and 80 bpm for sedentary females but these rates are often significantly different for trained athletes.

#### Table 2.4 Heart Rate and Respiratory Rate for Different Ages

|  |  |  |
| --- | --- | --- |
| Age | Heart Rate (BPM) | Respiratory Rate  (Breathes/min) |
| 0-5 months | 90-150 | 25-40 |
| 6-12 months | 80-140 | 20-30 |
| 1-3 years | 80-130 | 20-30 |
| 3-5 years | 80-120 | 20-30 |
| 6-10 years | 70-110 | 15-30 |
| 11-14 years | 60-105 | 12-20 |
| 14+ years | 60-100 | 12-20 |

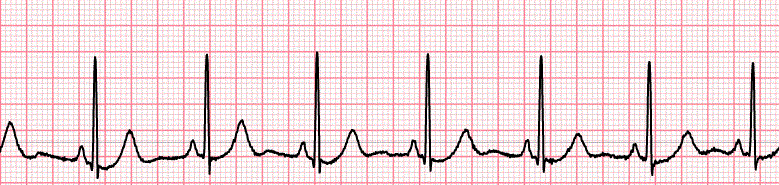
**Effect of Temperature on Heart Function:**

Variations in body temperature can cause a greatly variations in heart rate in a proportional relationship. Decreased temperature can cause the HR to fall as low as a few beats per minute when a person is near death when the body temperature range of 60° to 70°F. These effects assure the fact that heat increases the permeability of the cardiac muscle membrane to ions that control heart rate, resulting in acceleration of the self-excitation process.

## Electrocardiograph

Electrical current flows from the heart and a small fraction of it makes it way to the body surface as the cardiac impulse go through the heart. Electrocardiograph or ECG for short detects and records these electrical signals that are responsible for pumping blood by the heart all around the body.

A normal electrocardiogram is shown in Figure.



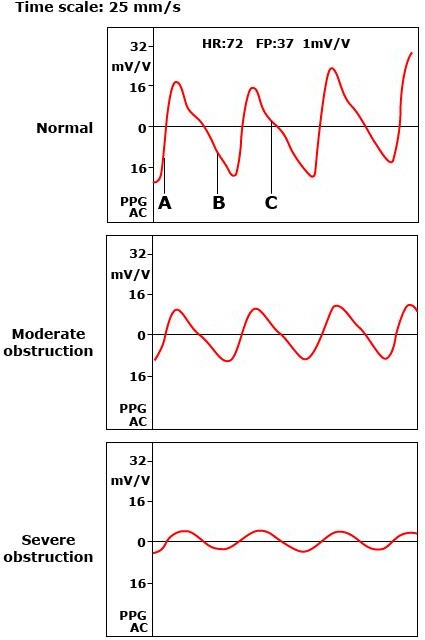
#### Figure 2.5 Normal ECG.

ECG is an indication of the patient’s heart health by recording the electrical activity to be read by specialized doctors which able to extract vital signs from it. Hence, HR can be calculated from ECG. [7]

## Photo plethysmograph

The PPG is a low-cost and portable technique that for measuring blood volume changes by collecting the variations in reflected or transmitted light. The blood pressure, blood oxygen saturation, HR, cardiac output recently and information of the cardiovascular system can be supplied with this technique. PPG experiences developments continuously, some researchers have used digital cameras and others a smart phone to detect HR by PPG technique.

However, overcoming the motion artifact is a huge challenge for PPG as it is sensitive it. Adaptive noise cancellation (ANC), which uses accelerometers as a noise reference, is proposed in order to help in reducing the affection of motion artifact.



#### Figure 2.6 PPG of different conditions.

## Heart Attack

Cardiovascular diseases (CVDs) are disorders of the heart and blood vessels which they include:

1. Coronary heart disease which is a disease of the blood vessels supplying the heart muscle;
2. Cerebrovascular disease which is a disease of the blood vessels supplying the brain;
3. Peripheral arterial disease which is a disease of blood vessels supplying the arms and legs;
4. Rheumatic heart disease which is a damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria;
5. Congenital heart disease which is malformations of heart structure existing at birth;
6. Deep vein thrombosis and pulmonary embolism which is blood clots in the leg veins, which can dislodge and move to the heart and lungs.

Heart attacks and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart or brain. The most common reason for this is a build-up of fatty deposits on the inner walls of the blood vessels that supply the heart or brain. Strokes can also be caused by bleeding from a blood vessel in the brain or from blood clots. The cause of heart attacks and strokes are usually the presence of a combination of risk factors, such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol, hypertension, diabetes and hyperlipidaemia.

The most important behavioral risk factors of heart disease are unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol. These risks affect raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity.

## Symptoms of Heart Attacks

Often, there are no symptoms of the underlying disease of the blood vessels. A heart attack or stroke may be the first warning of underlying disease. Symptoms of a heart attack include:

* Pain or discomfort in the centre of the chest;
* Pain or discomfort in the arms, the left shoulder, elbows, jaw, or back.

In addition the person may experience difficulty in breathing or shortness of breath; feeling sick or vomiting; feeling light-headed or faint; breaking into a cold sweat; and becoming pale. Women are more likely to have shortness of breath, nausea, vomiting, and back or jaw pain.

The most common symptom of a stroke is sudden weakness of the face, arm, or leg, most often on one side of the body.

Rheumatic heart disease is caused by damage to the heart valves and heart muscle from the inflammation and scarring caused by rheumatic fever. Rheumatic fever is caused by an abnormal response of the body to infection with streptococcal bacteria, which usually begins as a sore throat or tonsillitis in children.

Rheumatic fever mostly affects children in developing countries, especially where poverty is widespread. Globally, about 2% of deaths from cardiovascular diseases is related to rheumatic heart disease.

At least three quarters of the world's deaths from CVDs occur in low-and middle-income countries. That is due to people in these countries often does not have the benefit of integrated primary health care programs for early detection and treatment compared with high-income countries.

People in low- and middle-income countries who suffer from CVDs have less access to effective and equitable health care services which respond to their needs. As a result, many people are detected late in the course of the disease and die younger from CVDs.

At macro-economic level, CVDs place a heavy burden on the economies of low-and middle- income countries.

To reduce the burden of CVD in low-income implemented even in low-resource settings have been identified by WHO for prevention and control of cardiovascular diseases. They include two types of interventions: population-wide and individual.

According to WHO, population-wide interventions that can be implemented to reduce CVDs include:

1. Comprehensive tobacco control policies
2. Taxation to reduce the intake of foods that are high in fat, sugar and salt
3. Building walking and cycle paths to increase physical activity
4. Strategies to reduce harmful use of alcohol
5. Providing healthy school meals to children.

At the individual level, for prevention of first heart attacks and strokes, individual health-care interventions need to be targeted to those at high total cardiovascular risk or those with single risk factor levels above traditional thresholds, such as hypertension and hypercholesterolemia. The former approach is more cost-effective than the latter and has the potential to substantially reduce cardiovascular events. This approach is feasible in primary care in low-resource settings, including by non-physician health workers.

# Chapter 03

## Proposed System

# Chapter 04

## Implementation

# Chapter 05

## Result and Data Analysis

# Chapter 06

## Conclusion and Future Work

# Chapter 07

## Reference