Covid-19 Testing Management System

[1]Sanjeev R

[1]*Department of Computer Science and Engineering, Brindavan College of Engineering, Bengaluru, India*

Abstract
The Coronavirus Disease (COVID-19) pandemic has impacted the economy, livelihood, and physical and mental well-being of people worldwide. The present study provides an overview of the coronavirus disease 2019 (COVID-19) outbreak which has rapidly extended globally within a short period. COVID-19 is a highly infectious respiratory disease caused by a new coronavirus known as SARS-CoV-2 (severe acute respiratory syndrome-coronavirus-2). SARS-CoV-2 is different from usual coronaviruses responsible for mild sickness such as common cold among human beings. It is crucial to understand the impact and outcome of this pandemic. Conducting numerous, rapid, and reliable PCR tests for SARS-CoV-2 is essential for our ability to monitor and control the current COVID-19 pandemic. As a solution to the aforementioned problem, a website implementation is reported here. The title of this web application is COVID-19 TESTING MANAGEMENT SYSTEM.
Keywords: Coronavirus Disease, SARS-CoV-2, pandemic, PCR tests
----

I.INTRODUCTION
The function of this website can be described as follows- If a person undergoes any Covid-19 symptoms, he/she can undergo the Covid-19 test. There are particularly three Covid tests which are **Antigen**, **RT-PCR**, **CB-NAAT** present in this website. A person can choose any of the above-mentioned tests for testing the Coronavirus disease. The test which is chosen by the person is monitored by the website Admin. The admin can add/delete the Phlebotomist and assign him/her to take care of the tests which is undergone by the user. So, the user will be able to track his/her test reports by entering mobile number, order-id or user name. Admin and Phlebotomist will update the user every time when the test report is progressed. Finally, when admin and phlebotomist update the report is ready, the user will be able to download his/her Coronavirus disease report. Thus, this website helps a person to undergo Covid tests which will be helpful to stop the spread of this pandemic world-wide. The website uses **MYSQL** database to store all user details and credentials. This database consists of carefully evaluated, normalized tables interrelated to classify and delegate the information to be stored.

The website is developd using front-end tools- **HTML (Hypertext Markup Language), CSS (Cascading Style Sheets), JavaScript and Bootstrap framework. PHP (Hypertext pre-processor)** is aback-end language used to connect the front-endand **MYSQL** database. The home page of the website contains a short description about Covid-19, symptoms and prevention to be taken. This is followed by a Testing section where the user can easily submit his personal details for undergoing the Covid test.

1.1.1   About SQL
Database is logically structured collection of information. A database consists of tables which is the representation for a particular type of object and the columns of a table represent the properties or attributes of this type. Database Management comprises of creation and maintenance of tables in the said database. A language that facilitates the creation, maintenance and access to the database is Structured Query Language (SQL). There are two types of queries that SQL supports- Data Definition Language and Data Manipulation Language. Data Definition Language consists of the queries or instructions that creates or alters tables. Data manipulation language on the other hand, comprises of the queries that is used to modify the data or rows present in tables such as the insert, update and delete commands. In Covid-19 Testing Management System web application, SQL is abundantly used to store and manipulate the database stored in the MYSQL backend. This is a relational database, so the usage of SQL is the optimal.

1.1.2   Introduction to Front-end tools

Covid-19 Testing Management System web application uses HTML for creating the structure of the web content, CSS for defining the styles for the web pages. It is used to give styling to the HTML structure, JavaScript for allowing user to interact with webpages. A framework called Bootstrap is used to quicky design and customize the webpage.

Advantages of using front-end tools for this website is that because it helps developer to build attractive website layouts with ease. These tools help to accelerate the web development process by providing drag and drop elements and various built-in features to create an attractive web design layout. Data or information entered in this front-end is stored at the back-end MYSQL database.

II. CONTEXTS (Theory)

HTML: It is abbreviated as Hypertext Markup Language used as document to design web browser. It mainly provides a skeleton structure to the website. It consists of a series of elements. HTML elements tell the browser how to display the content.

CSS: It is abbreviated as Cascading Style Sheets. It mainly provides a design to skeleton structure of HMTL. It describes how HTML elements are to be displayed on screen, paper, or in other media CSS saves a lot of work. It can control the layout of multiple web pages all at once

Bootstrap: Bootstrap is the most popular CSS Framework for developing responsive and mobile-first websites. Bootstrap 5 is the newest version of Bootstrap.

JavaScript: JavaScript is the programming language for the Web. It can update and change both HTML and CSS. It can calculate, manipulate and validate data.

PHP: It is abbreviated as Hypertext Pre-processor. PHP plays a crucial role in the backend development of a website. It is integrated with multiple databases such as MySQL, SQL Server, PostgreSQL, and Oracle. Programming languages such as PHP run on frameworks that ease the web development process.

MYSQL: A database is a structured collection of data. It may be anything from a simple shopping list to a picture gallery or the vast amounts of information in a corporate network. To add, access, and process data stored in a computer database, you need a database management system such as MySQL Server. Since computers are very good at handling large amounts of data, database management systems play a central role in computing, as standalone utilities, or as parts of other applications.

III.LITERATURE REVIEW

At the end of 2019, a new virus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (COVID-19), causing severe acute respiratory syndrome, expanded globally [1], and significantly changed the patterns of population's physical activity. Due to the recommendations of social isolation and restrictions on daily behaviours, activities with greater energy expenditure has been significantly reduced, changing the population's physical exercise patterns, increasing sedentary lifestyle [2]. Considering the effects of quarantine in reducing the level of physical activity, the World Health Organization published recommendations so that the population can remain physically active [3].

During quarantine levels of physical activity (PA) and exercises suffer a radical change, affecting the person's lifestyle and behaviours. In addition, prolonged quarantine has a negative psychological impact, including symptoms of post-traumatic stress, confusion and anger, related to fear of infection, frustration, boredom, inadequate supplies and information, financial loss and stigma [4]. There is evidence that just a few weeks of physical inactivity is enough to increase risk of cardiovascular disease, reduce muscle mass and produce significant changes in metabolism and in the immune system [5], especially in the elderly population [6].

Additionally to PA level reduction, changes in eating habits and associated negative psychological factors, quarantine increases risk of cardiovascular disease in the entire population and it is related to increased oxidative stress [7]. However, these lifestyle changes can be even more serious in people with cancer and cardiovascular disease (CVD). Patients with cancer and COVID-19, the most serious cardiovascular complications are related to antineoplastic therapy. Patients with CVD, the possible relationship between COVID-19 and the development of acute myocarditis, heart failure and arrhythmias, increases complications risk especially in the elderly with diabetes and hypertension [8]. Thus, the clinical management of these patients

must pay special attention to monitoring cardiovascular problems associated with COVID-19 and other traditional cardiovascular problems, both during and after this quarantine period [9].

However, precautions in the physical exercise prescription should not be considered only for patients with severe COVID-19, CVD and risk factors, as there are no studies that indicate that asymptomatic or symptomatic people who have not been hospitalized may have some cardiovascular impairment due to exposure to COVID-19 [10]. Thus, complementary exams for the diagnosis of cardiovascular abnormalities should be considered for physical exercise prescription, including the young population and athletes, who are submitted to high amounts and exercises intensities [11], especially when quarantine period is over and they return to their physical exercise routines.

IV. PROPOSED SYSTEM

The aim of this project is to create an innovative application for testing Coronavirus disease which has made an economic and social disruption. The motivation behind creating this web application was the need of a platform to showcase how this pandemic can be stopped from further spread. Testing of all people for SARS-CoV-2, including those who have no symptoms, who show symptoms of infection such as trouble breathing, fever, sore throat or loss of the sense of smell and taste, and who may have been exposed to the virus will help prevent the spread of COVID-19 by identifying people who are in need of care in a timely fashion.

A positive test early in the course of the illness enables individuals to isolate themselves – reducing the chances that they will infect others and allowing them to seek treatment earlier, likely reducing disease severity and the risk of long-term disability, or death. A positive test for SARS-CoV-2 alerts an individual that they have the infection. Not only can they get treated faster, but they can take steps to minimize the spread of the virus.

From the academic perspective, the objective of this project to develop a scalable, reliable and secure website with an efficient storage backend mechanism and a neat frontend. To grasp the concepts of Database Management System, designing a real-time database, maintaining it and manipulating it is essential. With this project, these principles are to be learned and applied. The focus is towards designing an ER diagram that caters to our data needs, mapping this ER diagram into relational schema, creation of tables using this schema and establishment of relationships within these tables. The tables are aimed at achieving the highest Normal Forms, thus being efficient and reduce redundancy.

Following are the features of Covid-19 website:
- Admin's signup/login
- Phlebotomist portal for testing samples
- User registration
- Three tests available for user to get tested
- Guidelines to follow Covid-19 protocols
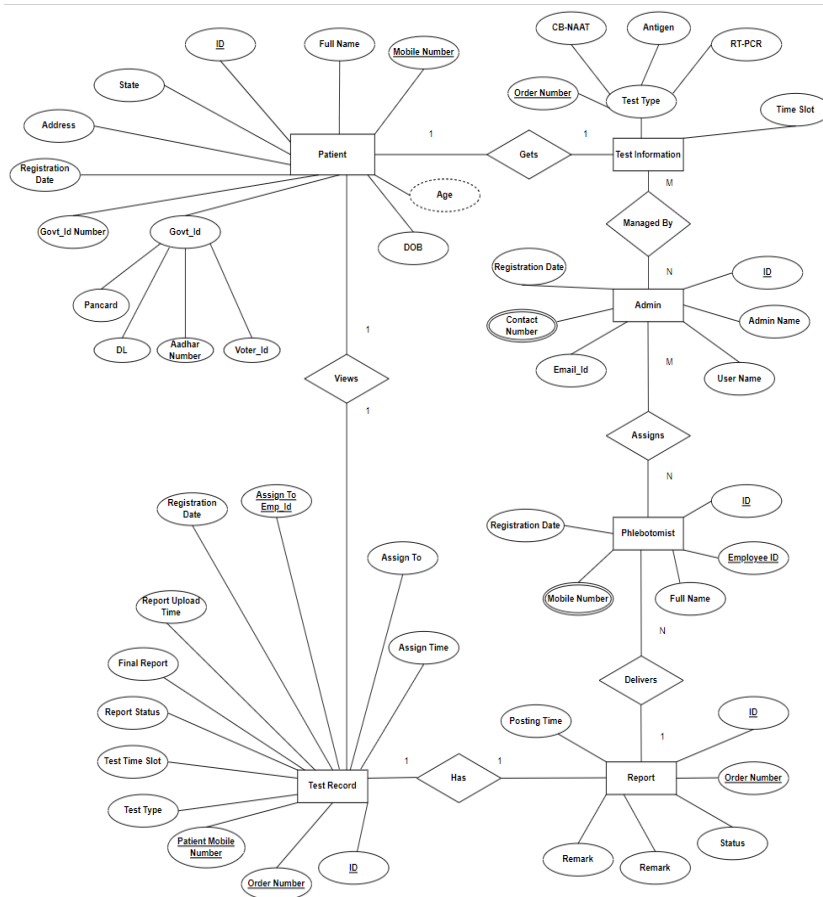- Website uses cookie policy to track user's behaviour

Fig-1: Proposed System Block Diagram

There are three main components namely Frontend, Backend, covid-19 test processing, and result, of the web application as it can be seen from the block diagram. All these components are inter-related and communicate using the PHP language. The scheme of the web application is shown in the below Fig. 2.
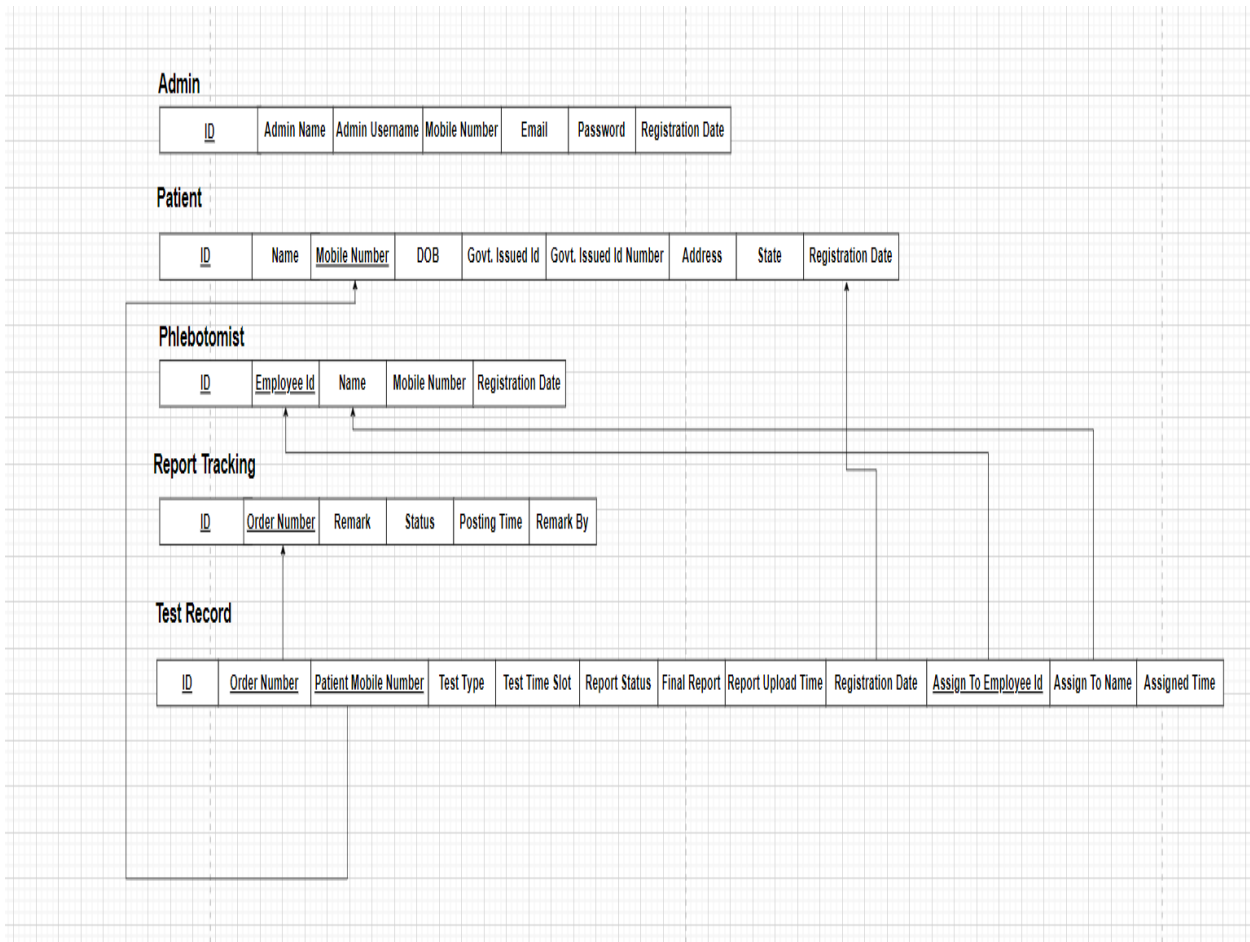
Fig-2: Proposed System Schema Diagram

V. IMPLEMENTATION

The development of the project has been completed. Many testing have been done on Brower as well on the mobile phone. It worked properly without any rendering or out-of-bound errors. I have attached the screenshots of the few pages/screens.
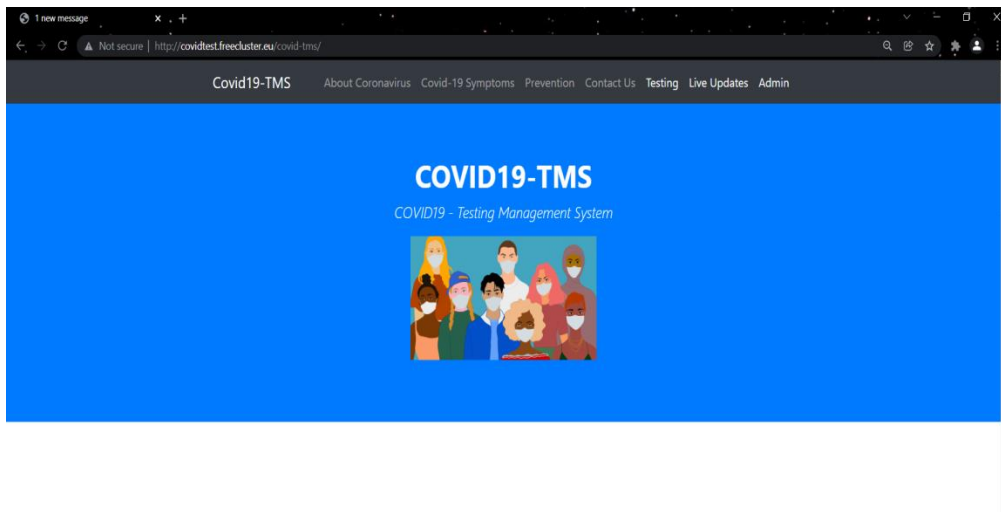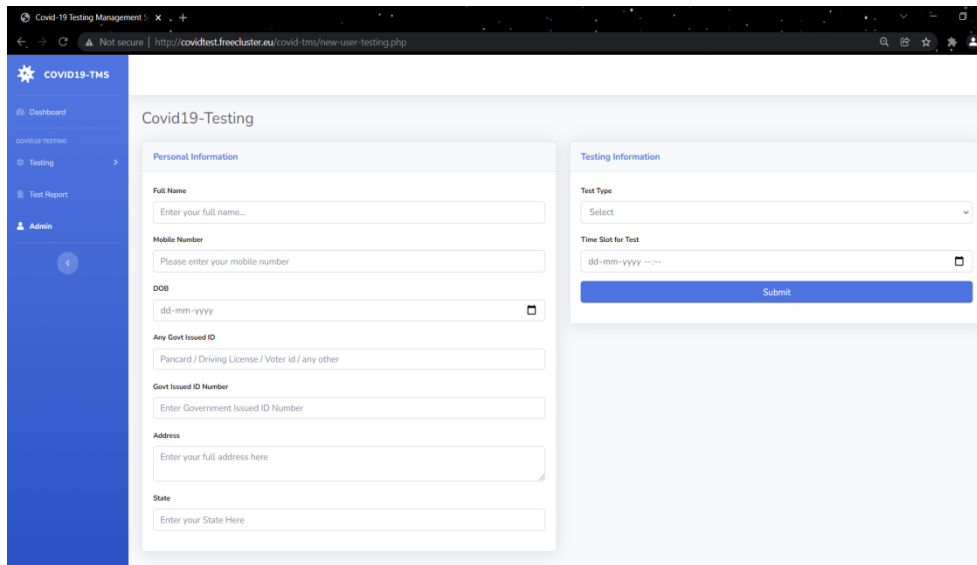

Fig-3: Homepage- Landing page
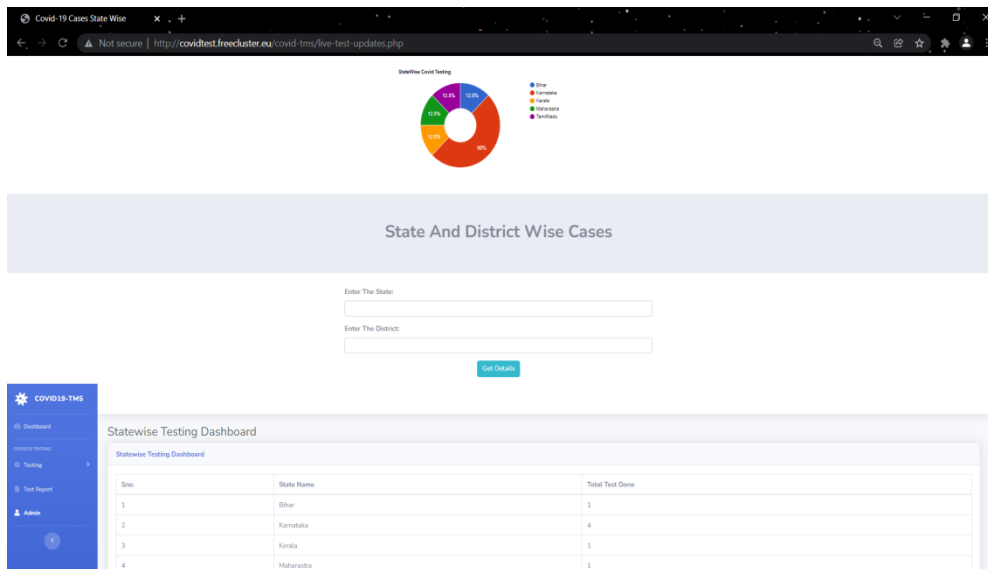
Fig-4: Testing Section for user/patient

Fig-5: Live Update Section (Pie chart visualization)

VI. CONCLUSION

Owing to the difficult times that the pandemic has posed upon India, people are facing many challenges in their day to day lives. The Coronavirus disease continues to spread across the world following a trajectory that is difficult to predict. The COVID-19 pandemic has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of falling into extreme poverty. Scientists from the NIH and across the country are working around the clock to establish programs that will ensure access to and acceptance of rapid and reliable testing around the country. Testing can help people determine if they are infected with SARS-CoV-2 – regardless of whether they have symptoms – and whether they are at risk of spreading the infection to others. Taking measures to prevent the spread of infection will be the most effective strategy for getting us safely back to work and school. This is what this project aimed at achieving. This project aims to create awareness to people about the pandemic and helps a person to get tested for Corona virus and minimize its spread. Testing is very important to help reduce the spread of Covid-19. As mentioned, this project has three basic tests for Coronavirus – Antigen, RT-PCR, CB-NAAT by which people can undergo these and help the country to stop the further spread of the disease.

REFERENCES

[1]. Patel A, Jernigan DB. Initial Public Health Response and Interim Clinical Guidance for the 2019 Novel Coronavirus Outbreak — United States, December 31, 2019–February 4, 2020. MMWR Morb Mortal Wkly Rep 2020; 69:140–146.

[2]. Cucinotta, D., & Vanelli, M. (2020). WHO Declares COVID-19 a Pandemic. Acta Biomed, 91(1), 157-160.

[3]. Centers for Disease Control and Prevention. (2020). CDC Methods for the Establishment and Management of Public Health Rapid Response Teams for Disease Outbreaks. Atlanta: Centers for Disease Control and Prevention.

[4]. Greiner AL, Stehling-Ariza T, Bugli D, Hoffman A, Giese C, Moorhouse L, Neatherlin JC, Shahpar C. Challenges in Public Health Rapid Response Team Management. Health Security. Jan 2020.S-8-S-13.

[5]. Hellewell, J., Abbott, S., Gimma, A., Bosse, N., Jarvis, C., & Russell, T. et al. (2020). Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. The Lancet, 8(4), 488-496.

[6]. World Health Organization. (2020). COVID-19: Operational Planning Guidelines and COVID-19 Partners Platform to support country preparedness and response. Retrieved 28 April 2020.

[7]. Centers for Disease Control and Prevention. (2020). COVID-19 72-hour Response Plan Checklist. Atlanta: CDC.

[8]. Anderson, R., Heesterbeek, H., Klinkenberg, D., & Hollingsworth, T. (2020). How will country-based mitigation measures influence the course of the COVID-19 epidemic?. The Lancet, 395(10228), 931-934.

[9]. World Health Organization. (2020). Risk assessment and management of exposure of health care workers in the context of COVID-19: interim guidance, 19 March 2020.

[10]. World Health Organization. (2020). Water, sanitation, hygiene, and waste management for the COVID-19 virus. Geneva: WHO. Retrieved 11 May 2020.