*A project report on*

# SELF HEALTH MONITORING SYSTEM

*Submitted in partial fulfilment for the award of the degree of*

## M.Tech Software Engineering

*By*

**ADITYA KISHAN (17MIS7027)**

**AMARAVATI**

**COMPUTER SCIENCE**

JUNE ,2019

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# CERTIFICATE

This is to certify that the thesis entitled “SELF HEALTH MONITORING SYSTEM” submitted by ADITYA KISHAN (17MIS7027) M. TECH SOFTWARE ENGINEERING, VIT-AP, for the award of the Summer Internship for the bonafide work carried out by him/her under my supervision.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university. The Project report fulfils the requirements and regulations of VIT-AP and in my opinion meets the necessary standards for submission.

**Signature of the Guide**

# ABSTRACT

The aim of this project is to build a web based health care application which can help in early and appropriate disease diagnosis. This in turn is expected to cut down the amount spent on general physician.

The proposed web application project ensures to cater needs across all demography. For example, there is a feature called “Pregnant Care Meter” which will tell whether proper care is being taken or not based on users’ choice over a series of questions. There is another feature called “Dementia Prediction” which tells probable chances of a user (elderly person) suffering from that disease. Apart from these there is a feature called “Basic Disease Diagnosis” which predicts the disease the user might be suffering from based on their choice of symptoms from the list.

We have also planned to store history of diseases/symptoms shown in the past for future reference.

## ACKNOWLEDGEMENT

It is my pleasure to express with deep sense of gratitude to Dr. S. GOPIKRISHNAN, Assistant Professor, School of Computer Science and Engineering, VIT-AP, for his/her constant guidance, continual encouragement, understanding; more than all, he taught me patience in my endeavour. I would like to express my gratitude to Dr. G. Viswanathan, Sankar Viswanathan, Kadhambari S. Viswanathan, Dr. D. Subhakar and Dr. HARI SEETHA, School of Computer Science and Engineering, for providing with an environment to work in and for his inspiration during the tenure of the course.

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It is indeed a pleasure to thank my friends who persuaded and encouraged me to take up and complete this task. At last but not least, I express my gratitude and appreciation to all those who have helped me directly or indirectly toward the successful completion of this project.

Place: AMARAVATHI

Date: 29-06-19 ADITYA KISHAN

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**LIST OF ACRONYMS**

WAMP –WINDOWS APACHE MYSQL PHP/PEARL/PYTHON

HTML – HYPER TEXT MARKUP LANGUAGE

PHP – HYPERTEXT PREPROCESSOR

CRM – CUSTOMER RELATIONSHIP MANAGEMENT

CSS – CASCADING STYLE SHEET

UI – USER INTERFACE

DFD – DATA FLOW DIAGRAM

CAGR – COMPOUND ANNUAL GROWTH RATE

PCP – PRIMARY CARE PROVIDERS

**Chapter - 1**

# INTRODUCTION

## 1.1 INTRODUCTION

Self-monitoring is a new trend in personal health where individuals use software technologies to collect, process and display a wide range of personal data to help them monitor and manage their personal health.

The current, relatively early generation of self-monitoring tools enables the user to monitor and record details of his or her everyday activity, from counting steps or miles walked and floors climbed, to monitoring daily symptoms observed, as well daily patterns and hours of sleep. Future developments will expand the range of physiological variables that can be self-monitored and enhance the usefulness of the data thus collected. The growing use of self-tracking, facilitated by recent advances in technology, heralds "the biggest shake-up in the history of medicine," according to Eric Topol, a prominent physician .

The overall system can be accessed through mobile/desktop. Functionalities like "Basic Disease Diagnosis", "Dimentia Prediction" and "Pregnant Care Meter" can be accessed by filling forms. The data corresponding to selected checkboxes are processed and corresponding results are displayed. To avoid clash of predicted diseases various constraints are set. Also, exclusive services and features like "clean and clutter free UI", "Search Doctor in your city" and "Save Symptoms History" are expected to help up stand out amongst the crowd.

In this documentation, we will discuss about problems in the existing system, corresponding solutions, global market of self-health monitoring, status and efficiency general physicians and services/functionalities offered in the project.

## 1.2 OVERVIEW OF THE PROJECT

This section describes our solution to the aforementioned problem. The First Level DFD is illustrated in figure 1.

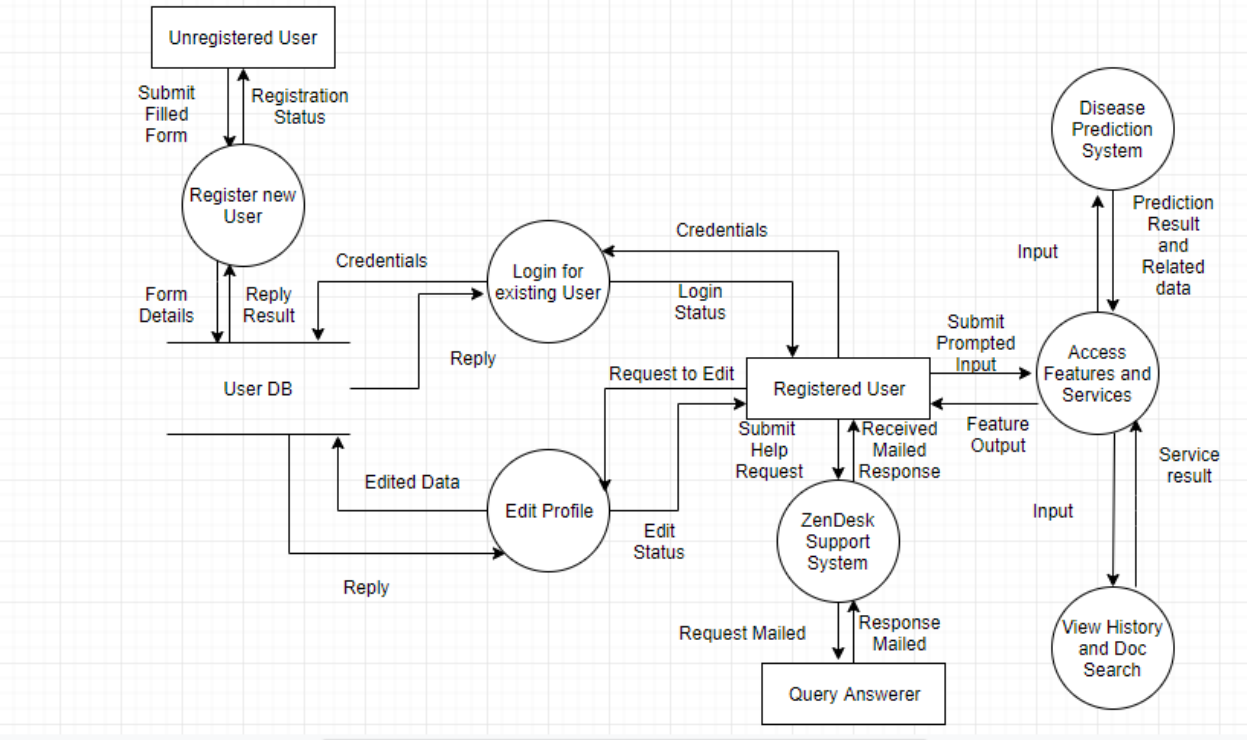


Figure 1.1: Highest Level DFD diagram

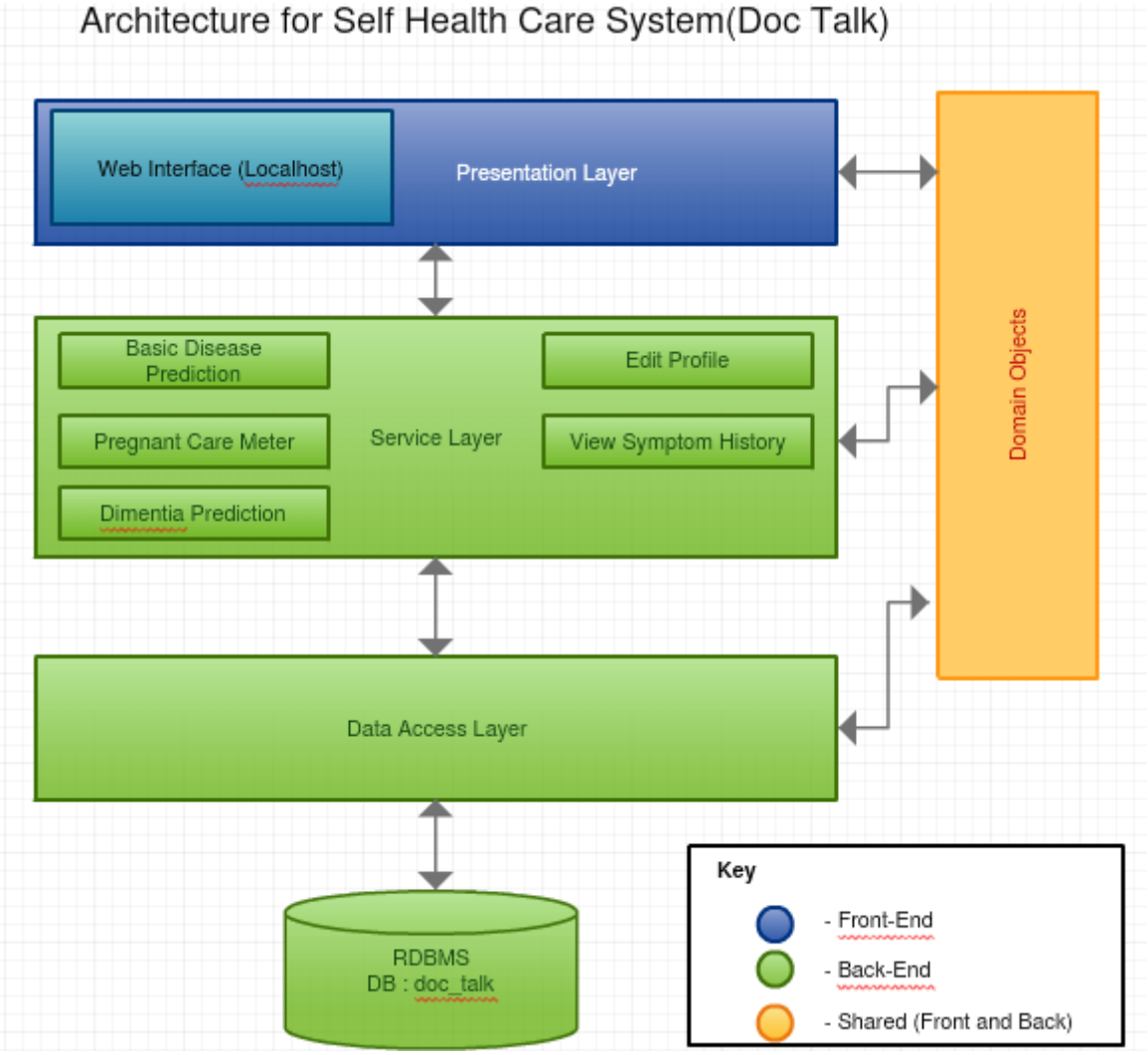


Figure 1.2: Overall System Architecture

### 1.2.1 TECHNOLOGIES USED IN THE PROJECT

All the necessary technology used in the web application development (HTML, CSS, Bootstrap, Javascript, PHP ,MySQL) are very widely used in the industry and have a very diverse community support.

HTML,CSS and Bootstrap has been used to create user friendly and responsive UI. Javascript was used for processing the data and predicting the result. PHP was used for authentication of user and storing and retrieval of data from MySQL Database. Apart from these some 3rd party software and services were used.

1. ZENDESK (Query support system)

2. WAMP (bundled with PHP,MySQL and Apache)

#### 1.2.1.1 3RD PARTY SOFTWARE EMBEDDING (ZENDESK)

At its core, Zendesk is a customer support platform that lets you connect with customers on any channel.

Whether your customers want to connect by phone, chat, email, social media, or any other channel, Zendesk brings all your customer interactions to one easy to use platform to make it easy to keep track of all your support requests, answer questions quickly, and monitor customer service agent's effectiveness.

Zendesk's products are easy to set up and start using fast - most anything you'll need to use feature-wise will work right out of the box.

And their platform offers all the customer relationship management (CRM) tools you need in an industry-leading cloud platform, so whether your a fast-growing startup or enterprise looking to improve your current standards, Zendesk can scale to meet your needs.

#### 1.2.1.2 WAMP

Stands for "Windows, Apache, MySQL, and PHP." WAMP is a variation of LAMP for Windows systems and is often installed as a software bundle (Apache, MySQL, and PHP). It is often used for web development and internal testing, but may also be used to serve live websites.

The most important part of the WAMP package is Apache (or "Apache HTTP Server") which is used run the web server within Windows. By running a local Apache web server on a Windows machine, a web developer can test webpages in a web browser without publishing them live on the Internet.

WAMP also includes MySQL and PHP, which are two of the most common technologies used for creating dynamic websites. MySQL is a high-speed database, while PHP is a scripting language that can be used to access data from the database. By installing these two components locally, a developer can build and test a dynamic website before publishing it to a public web server.

While Apache, MySQL, and PHP are open source components that can be installed individually, they are usually installed together. One popular package is called "WampServer," which provides a user-friendly way to install and configure the "AMP" components on Windows.

## 1.3 CALCULATIONS AND CONSTRAINTS BEHIND PREDICTION

In Disease Prediction (Basic Disease Diagnosis, Dimentia Prediction), users select the checkboxes corresponding to the symptoms observed.

CONSTRAINTS:

To avoid “False Positives” and “False Negatives”, we have set constraints on the number of selected checkboxes. Only if atleast 2/3$^{rd}$ of the symptoms corresponding to a particular disease match with the set of selected checkboxes, that disease is predicted. At the same time, to avoid simultaneous condition fulfilment of two different medical conditions, we have restricted checkbox selection to less than 4/3$^{rd}$ of total symptoms corresponding to a disease. If selected checkboxes do not fulfil aforementioned conditions corresponding to any disease, then a message stating “No specific disease found, kindly consult a doctor” is displayed.

CALCULATIONS:

When minimum condition for disease prediction is met then a message “you may be suffering from “Disease-name” “is displayed.

When at least 5/6 of the symptoms corresponding to a particular disease matches then a message “Fairly high chance of “Disease-name” “is displayed.

## 1.4 PROBLEMS IN THE EXISTING SYSTEM

There are plethora of web-based Health Care Services available on internet. But each of them lack in one or more areas that we offer. Some of them are too costly to be afforded, while others offer a very few services. There are a few free health care services, but the UI is so cluttered with irrelevant ads that patients would not like to visit it again.

Following are some of the problems in the existing system:

I. Most of the people still rely on medical consultants for even basic disease diagnosis. But unfortunately, it is practically not possible for a medical consultant to be available at your service 24x7.
II. There are a very few already available web-applications which are working in this field but even after paying the hefty amount, customers do not get the standard quality of service.
III. A track record of the symptoms shown by your body over a period, will definitely help your doctor predict the stage of the disease. But it is not manually feasible to maintain such a record.
IV. Absence of a platform which helps us find best doctor in the city in the specified field.
V. Absence of a responsive query platform.

### 1.4.1 SOLUTIONS

Following are solutions to above stated problems:

I. The web application will be available 24x7 at customer service.
II. The proposed web application aims to fill the void of a standard online healthcare service at a nominal or zero cost.
III. A medical history of symptoms shown by your body will be stored in the database (when you save the result of “Basic Disease Diagnosis”). This information/data can be shared with a doctor to help him predict the stage of the disease the patient is presently in.
IV. An exclusive feature called “Search Doctor in your city” has been included which gives complete doctor details in your city in the specified field.

V. 3rd Party software called “ZENDESK” has been embedded to cater the need of reliable support system.

## 1.5 PROJECT STATEMENT

The proposed project “Self-Health Monitoring” application is a web-based service accessed by anyone connected to internet.

Apart from “Basic Disease Diagnosis”, it also predicts probable chances of specific medical conditions like “Dimentia”. It is aimed at cutting down the expenditure on medical consultants for basic disease diagnosis. Contrary to regular medical consultants who are rarely available during odd hours, the application can be accessed 24x7.

Exclusive services and features like “clean and clutter free UI “, “Search Doctors in your City”, “Pregnant Care Meter” and “Save Symptoms History” are expected to help us stand out amongst the crowd. Though this is a web-based healthcare service, there is a plan to launch its Android version soon.

## 1.6 OBJECTIVES

Following are the objectives of the project:

1. “Basic Disease Diagnosis” service which predicts the disease the patient is suffering from based on the list of symptoms chosen.
2. Predicting specific medical conditions like “Dimentia” in the same way.
3. Including a service called “Pregnant Care Meter” wherein pregnant women can know whether they are taking good care of themselves or not.
4. Including a service called “Search Doctors in your city” to search doctor specialised in diagnosed disease.
5. Including a service called “View History” wherein users can view timeline of symptoms shown by their body.

6. Including a “Edit Profile” option, with the help of which users can update and remove their account.
7. Embedding a reliable and responsive query platform where users can drop their query and can expect to get a prompt reply.
8. Every time a user tries to access a webpage without login, he is redirected to login page.

## 1.7 SCOPE

### 1.7.1 MILESTONES

1. Login and Registration. (Frontend) - 26 May, 2019
2. Login and Registration. (Backend) - 30 May, 2019
3. Homepage Creation and integration of query platform - 4 June, 2019
4. Basic Disease Diagnosis (Frontend and Backend) – 12th June, 2019
5. Dimentia Prediction (Frontend and Backend) – 14th June, 2019
6. Pregnant Care Meter (Frontend and Backend) – 16th June, 2019
7. Doc Search (Frontend and Backend) – 20th June, 2019
8. View History (Frontend and Backend) – 23rd June, 2019

### 1.7.2 LIMITS AND EXCLUSIONS

1. Presently only three diseases can be predicted.
2. Doctors details in the Database is also limited.
3. It is a web-based health care service, and its Android version is yet to be launched.

CHAPTER 2

# BACKGROUND

## INTRODUCTION

Even though we are living in a digital society where data tariff is easily affordable even by a middle- class family, still most of the people choose to pay hefty amount to medical consultants even for basic disease diagnosis. As discussed before, there are already available paid and unpaid web-based healthcare services on internet. Most of them are costly and do not offer a standard medical service.

## 2.1 MARKET

1. The global market for selected health self-monitoring technologies reached nearly $16.7 billion in 2016. This market should grow at a compound annual growth rate (CAGR) of 28.3% from $20.7 billion in 2017 to reach $71.9 billion by 2022.
2. Peripherals as a segment should reach $20.3 billion in 2017 and $70.9 billion by 2022, at a CAGR of 28.4% for the period 2017-2022.
3. Software applications as a segment should reach $373 million in 2017 and $1.0 billion by 2022, at a CAGR of 22.0% for the period 2017-2022.

The platform software and hub devices used in self-monitoring have value, of course, but as part of their respective manufacturers' whole "ecosystem" of connected devices. In the absence of specific sales numbers, it is necessary to conclude that Apple, Google and the others believe that health self- monitoring will enhance the value of the whole ecosystem to the point where returns on their investment in self-monitoring are very positive.

The health self-monitoring market is dominated by the U.S., which accounted for approximately 45% of global sales in 2016. The U.S. share of the market has declined from 80% in 2013; however, due to faster growth rates in non-U.S. markets. The latter are expected to account for two-thirds of the global market for wearable self-monitoring devices by 2022.

## 2.2 STATUS AND EFFICIENCY OF GENERAL PHYSICIANS

### 2.2.1 63% OF REFERRING PHYSICIANS ARE DISSATISFIED WITH THE CURRENT REFERRAL PROCESS DUE TO LACK OF TIMELINESS OF INFORMATION AND INADEQUATE REFERRAL LETTER CONTENT.

The referral process is a critical component of quality clinical care, and it has become increasingly scrutinized in the managed care era. Physician-to-physician communication is vital to the success of any outpatient referral. Optimal communication involves the transfer of relevant clinical information (from the referring physician to the specialist).

Breakdowns in communication can lead to poor continuity of care, delayed diagnoses, polypharmacy, increased litigation risk, and unnecessary testing, all of which diminish the quality of care.

Dissatisfaction with Information Content and Timeliness of the Referral Process

| | Primary Care Providers (%) | Specialists |
|---|---|---|
| Dissatisfaction with content of information they provided* | 13 (28) | 22 (11%) |
| Dissatisfaction with content of information they received | 13 (28) | 85 (43%) |
| Dissatisfaction with timeliness of information they received | 24 (50) | 95 (48%) |

*$P < .005$.

Table 2.1: Dissatisfaction with Information and Timeliness of the Referral Process

### 2.2.2 1 OUT OF EVERY THREE PATIENTS ARE SENT TO A SPECIALIST EACH YEAR.

In the United States, more than a third of patients are referred to a specialist each year. Indeed, specialist visits constitute more than half of all outpatient visits. Despite the frequency and the importance of the specialty-referral, the process itself has been a long-standing source of frustration for both primary care physicians (PCPs) and specialists. These frustrations, along with a desire to lower costs, has led to the implementation of numerous strategies to improve the entire process, such as using gatekeepers and/or referral guidelines

### 2.2.3 70% OF THE SPECIALISTS RATE THE PATIENT REFERRAL INFORMATION THEY RECEIVE FROM OTHER PROVIDERS AS FAIR OR POOR

PCPs vary in their threshold for referring a patient, which results in both the underuse and the overuse of specialists. Many referrals do not include a transfer of information, either to or from the specialist; and when they do, it often contains insufficient data for medical decision making. Care across the primary-specialty interface is poorly integrated; PCPs often do not know whether a patient went to the specialist, or what the specialist recommended. PCPs and specialists also frequently disagree on the specialist's role during the referral episode (e.g., single consultation or continuing co-management).

### 2.2.4 3 OF EVERY TEN TESTS ARE REORDERED BECAUSE THE RESULTS CANNOT BE FOUND.

These test results and labs are most likely lost somewhere in the care continuum, whether it be during the transfer from lab to PCP or specialist, or the transfer within hospital departments. This tends to result in redundant tests, which directly leads to the increasing cost of care; but more importantly, can lead to missed diagnoses and treatments, resulting in further injury or even death.

CHAPTER 3

# SERVICES AND FUNCTIONALITIES

## 3.1 DISEASE PREDICTION

### 3.1.1 BASIC DISEASE DIAGNOSIS

When this service is selected an HTML form is displayed consisting of list of symptoms. User must select all the checkboxes corresponding to the symptoms shown by their body (number of checkboxes selected should be within minimum and maximum set limit).If the selected checkboxes correspond to any particular disease then that disease is displayed ,giving remarks on its probable chances.

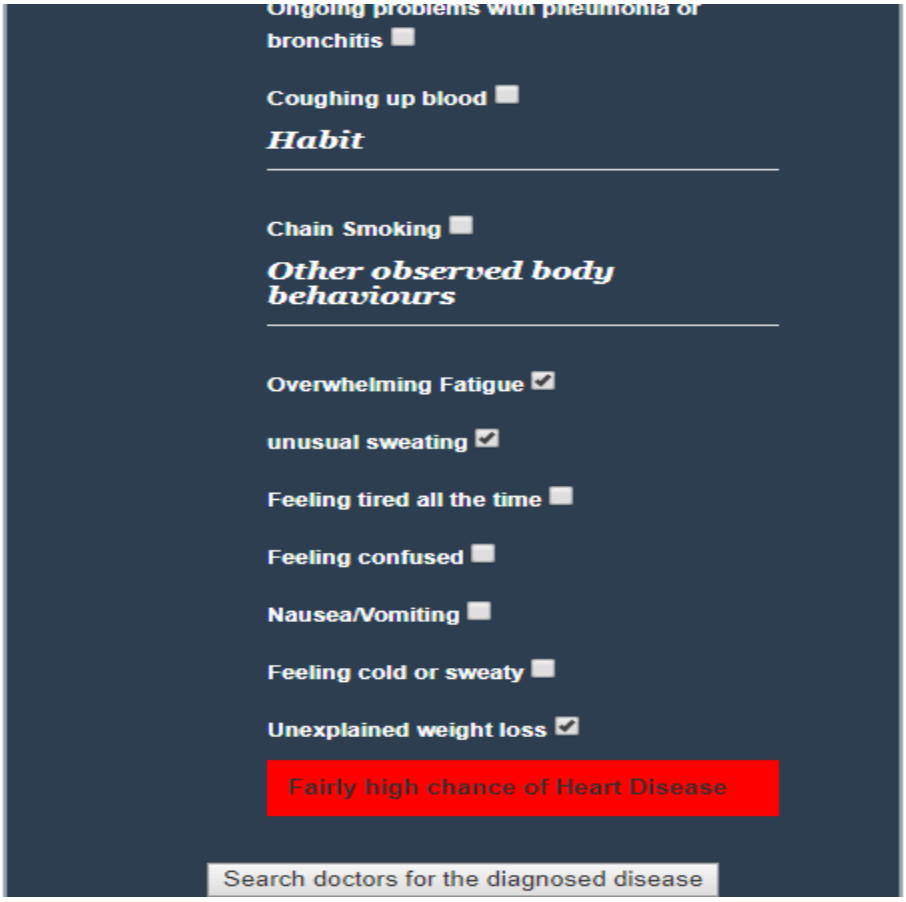


Fig 3.1: Basic Disease Diagnosis

### 3.1.2 DIMENTIA PREDICTION

When this service is selected a HTML form is displayed consisting of list of symptoms. User must select all the checkboxes corresponding to the symptoms shown by their body. On the basis of number of checkboxes selected ,probable chances of Dimentia is displayed.

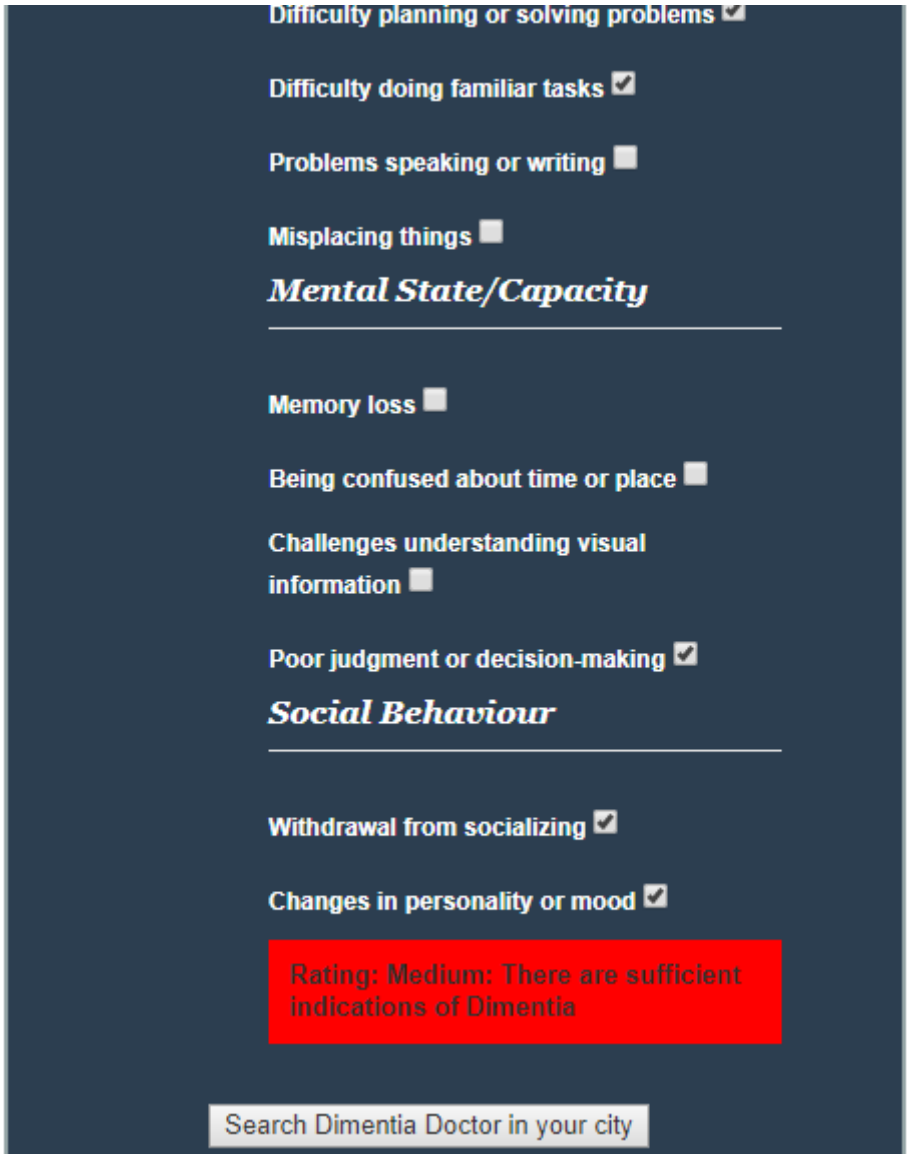


Fig 3.2: Basic Dimentia Prediction

### 3.1.3 PREGNANT CARE METER

When this service is selected an HTML form is displayed consisting of list of guidelines that a pregnant lady must follow. The user should select all the checkboxes corresponding to the guidelines they are following strictly. The result displayed will tell how good care the user (pregnant lady) is taking care of herself.

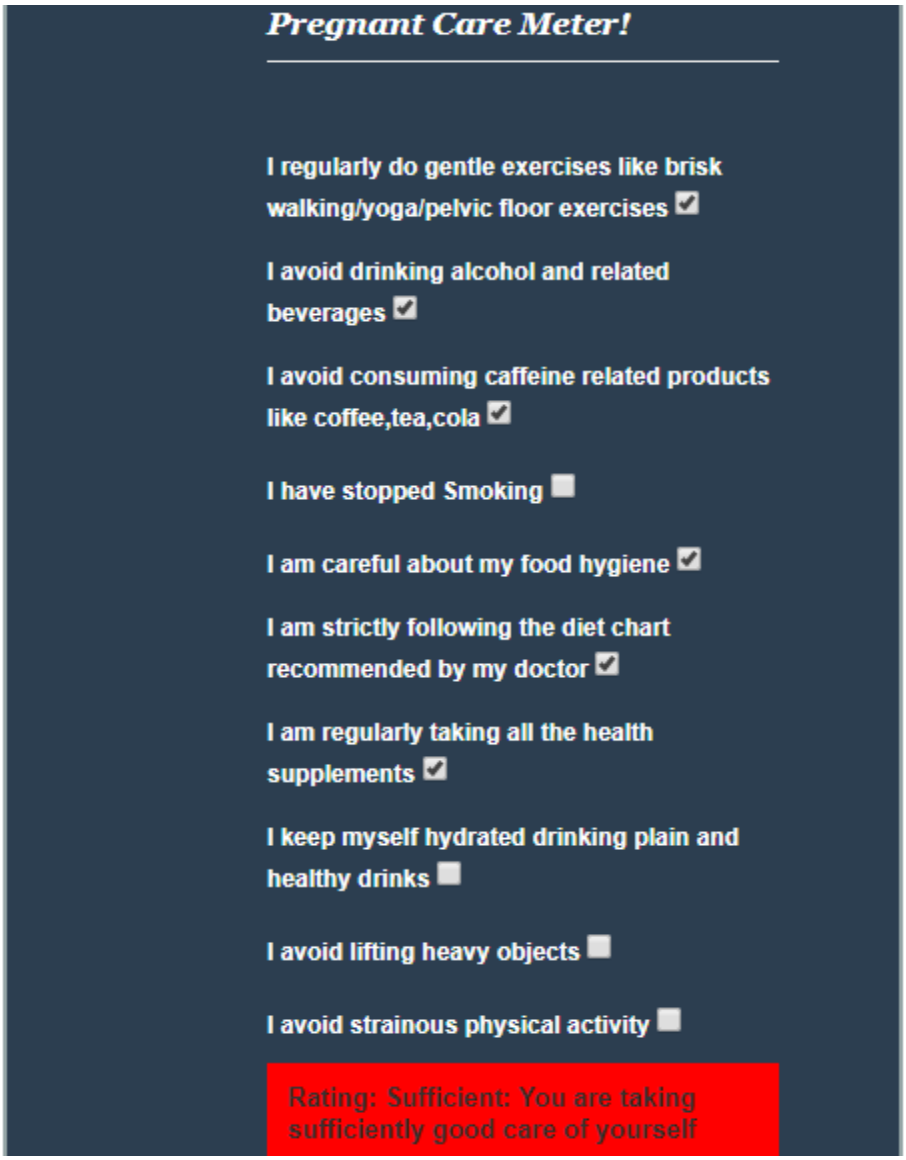


Fig 3.3: Pregnant Care Meter

### 3.1.4 SEARCH DOCTOR IN YOUR CITY

After Basic Disease Prediction and Dimentia Prediction , there is an option to search specialist doctor of the diagnosed disease in the city of your choice. The result displayed consists of name of the doctor , contact number and address.

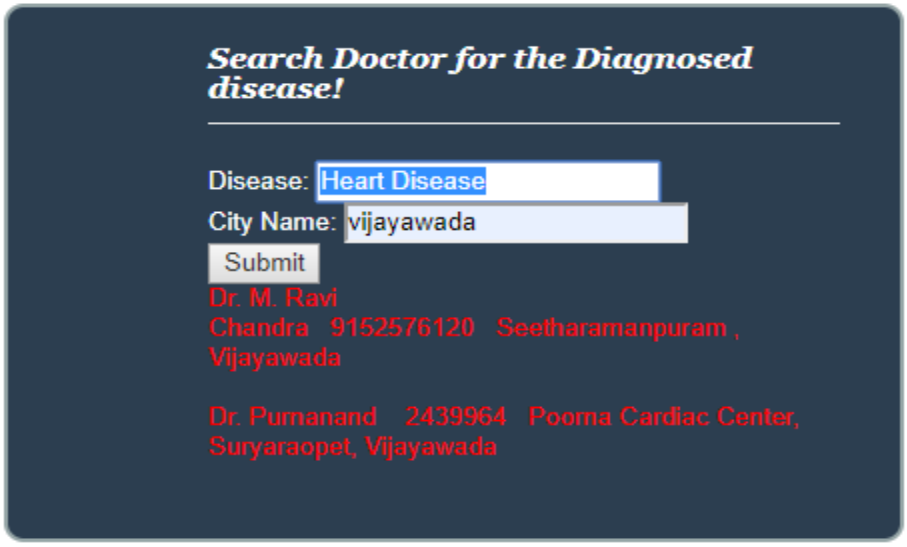


Fig 3.4: Search Doctors for diagnosed disease

Fig 3.5: Search Doctors for Dimentia

## 3.2 QUERY PLATFORM

### 3.2.1 ABOUT ZENDESK SUPPORT SYSTEM

At its core, Zendesk is a customer support platform that lets you connect with customers on any channel.

Whether your customers want to connect by phone, chat, email, social media, or any other channel, Zendesk brings all your customer interactions to one easy to use platform to make it easy to keep track of all your support requests, answer questions quickly, and monitor customer service agent's effectiveness.

Zendesk's products are easy to set up and start using fast - most anything you'll need to use feature-wise will work right out of the box.

And their platform offers all the customer relationship management (CRM) tools you need in an industry-leading cloud platform, so whether your a fast-growing startup or enterprise looking to improve your current standards, Zendesk can scale to meet your needs.

Fig 3.6: Zendesk

### 3.2.2 HOW IT WORKS

There is a dire need of a reliable and responsive query platform. So we have embedded a Zendesk support option in every webpage. On clicking it a form will pop up. User should type in his name, e-mail and message and click on “send message”. When the responder receives the message he responds back as soon as possible.

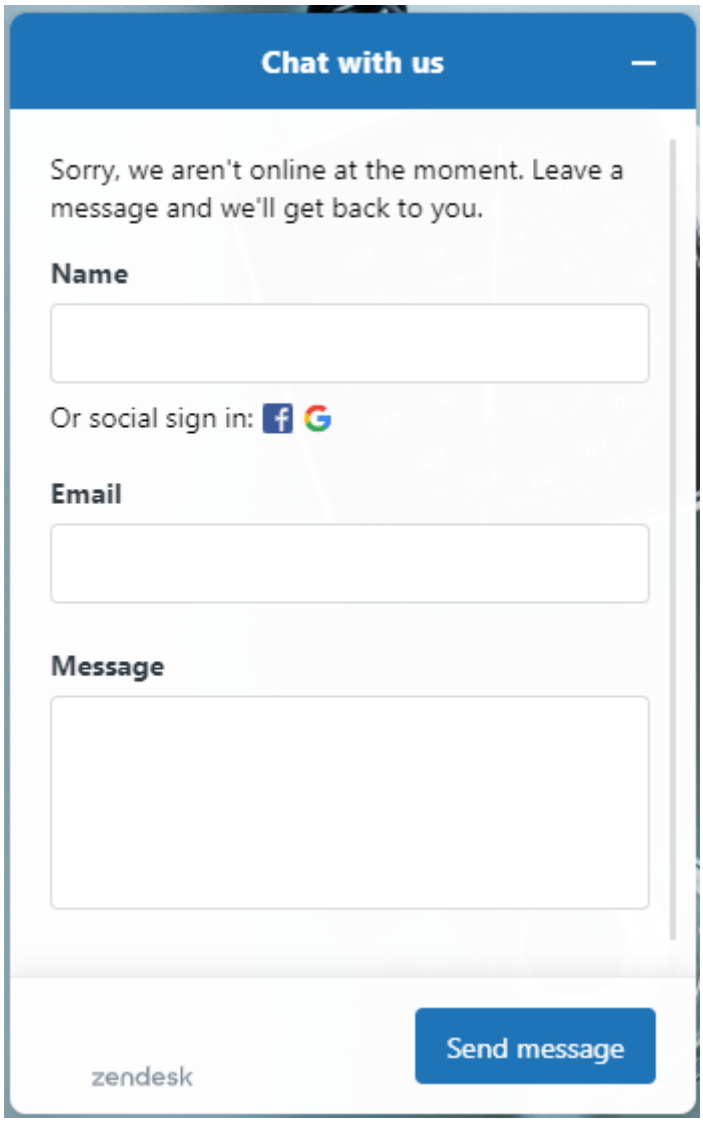


Fig 3.7: Zendesk Query Form

## 3.3 VIEW HISTORY

### 3.3.1 NEED

A track record of the symptoms shown by your body over a period, will definitely help your doctor predict the stage of the disease. But it is not manually feasible to maintain such a record.

That is the reason why there is an urgent need of a digital platform which can keep record of symptoms shown by patients body over a period of time.Unlike Physical records it wont be lost or destroyed (unless deleted manually).

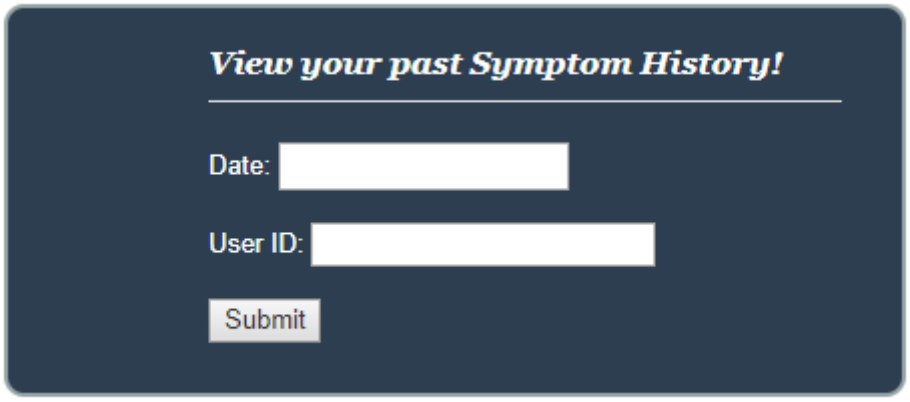


Fig 3.8: View History HTML form

### 3.3.2 HOW IT WORKS

Upon clicking “View History” menu button a new webpage with an HTML form embedded in it, opens up. Then user should fill the “Date” and his “User ID” and click on submit. On submitting, complete symptom details and disease predicted with exact date and time is displayed.

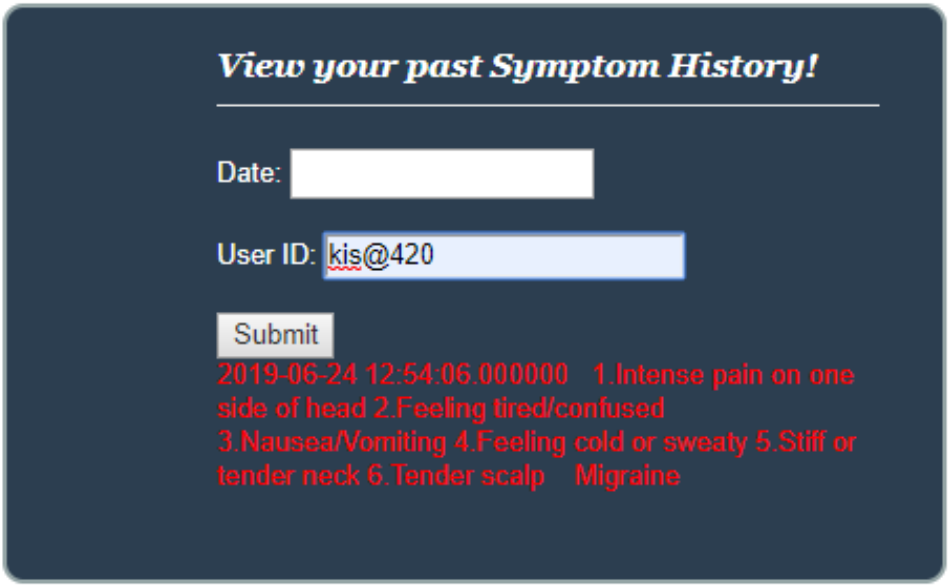


Fig 3.9: View History Result

## 3.4 EDIT PROFILE

There is a provision to edit profile wherein registered users can update and remove account by filling up the form. Only when the key credentials match with the one in database requested user details can be updated or removed.

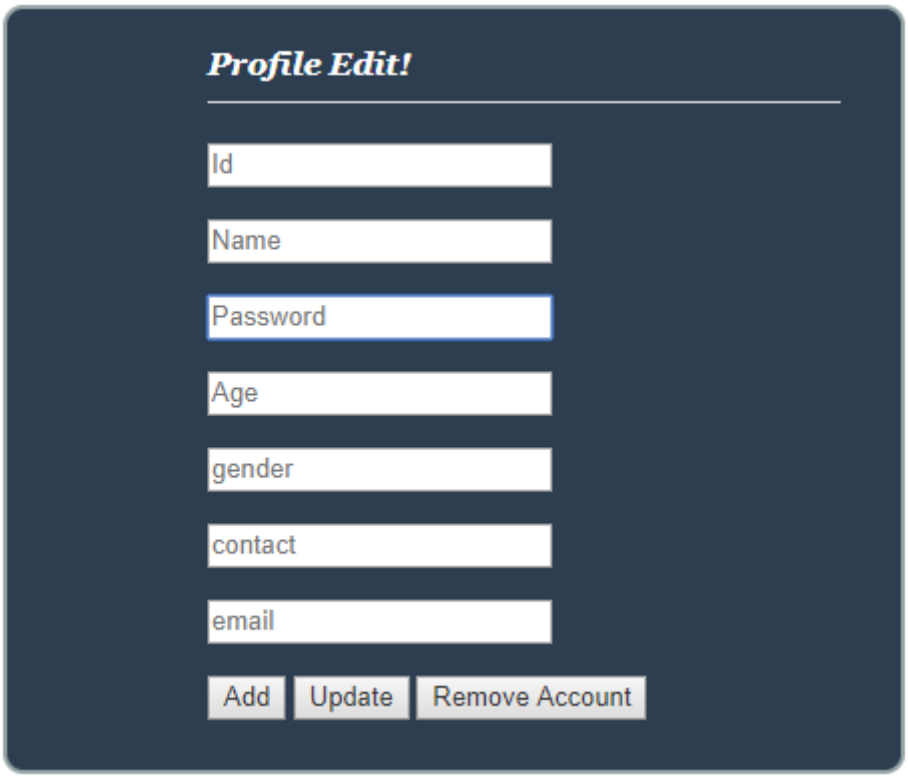


Fig 3.9.1: Edit Profile

### 3.4.1 HOW IT WORKS

Upon clicking “Edit Profile” menu button a new webpage with an HTML form embedded in it, opens up. To update user profile, user should first fill User ID and Password , then options which he wants to update.

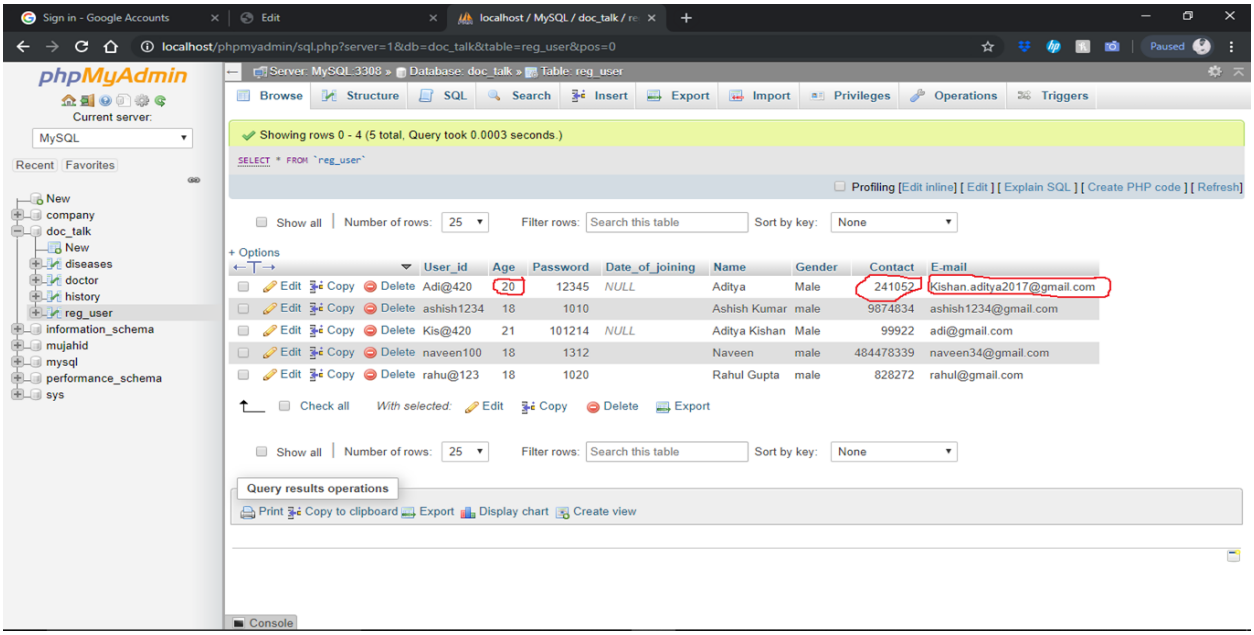


Fig 3.9.2: Before Editing

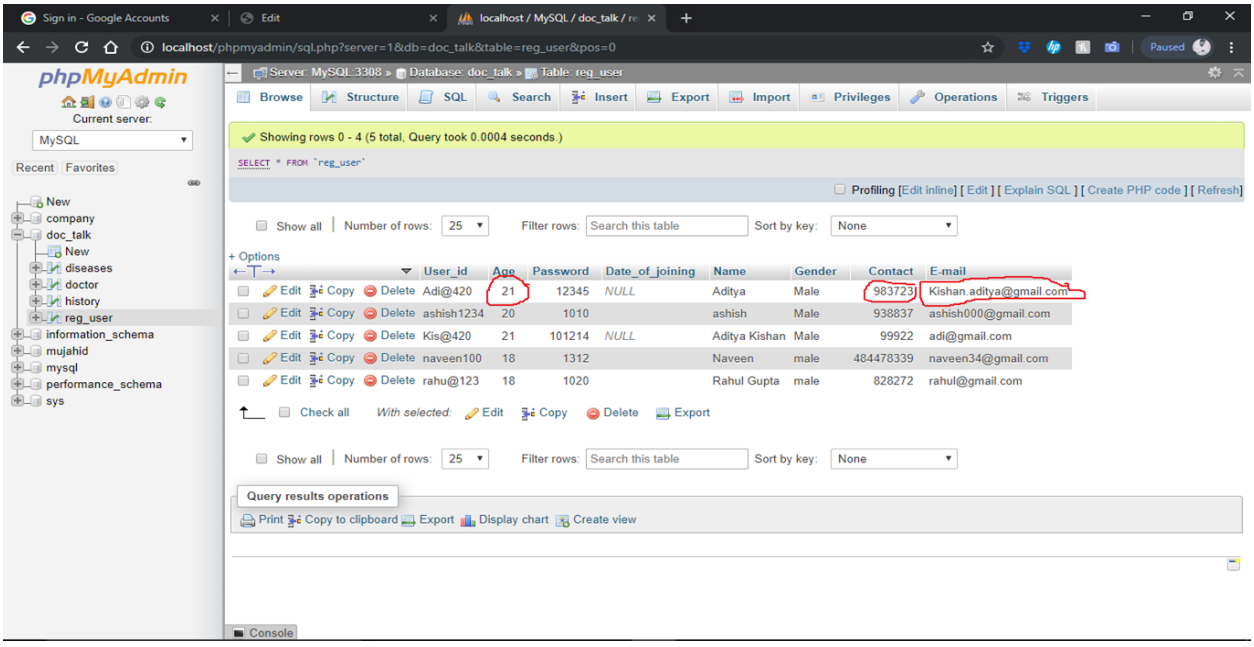


 Fig 3.9.3: After Editing

## 3.5 AUTHENTICATION

Authentication is the process of determining whether someone or something is, in fact, who or what it declares itself to be. Authentication technology provides access control for systems by checking to see if a user's credentials match the credentials in a database of authorized users or in a data authentication server.

### 3.5.1 NEED OF STRONG AUTHENTICATION SYSTEM

Authentication is important because it enables organizations to keep their networks secure by permitting only authenticated users (or processes) to access its protected resources, which may include computer systems, networks, databases, websites and other network-based applications or services.

Fig 3.9.4: Login Page

### 3.5.2 HOW IT WORKS

During authentication, credentials provided by the user are compared to those on file in a database of authorized users' information either on the local operating system or through an authentication server. If the credentials match, and the authenticated entity is authorized to use the resource, the process is completed and the user is granted access.

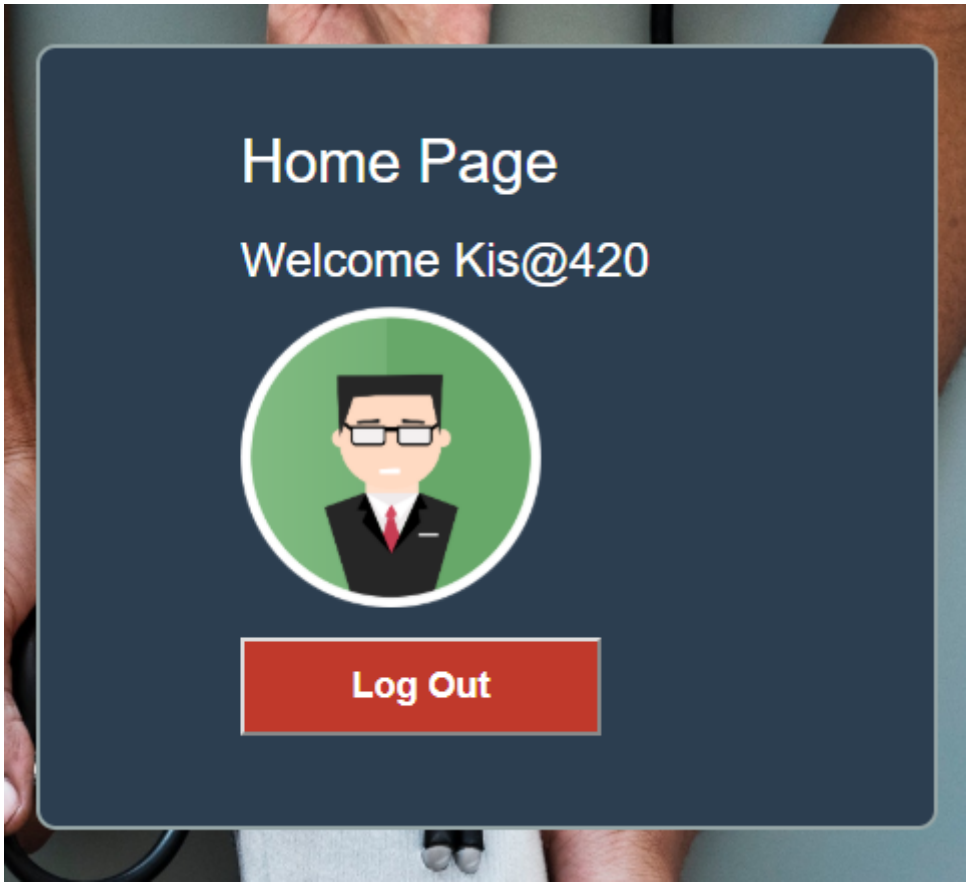


Fig 3.9.5: Successful Login

# 4. CONCLUSION

The ultimate purpose/aim of the project was to create a web-based “Self Health Monitoring” service, expected to cut down the expenditure on medical consultants for basic disease diagnosis.

Some people may call the project redundant owing to the presence of search engines like Google, wherein people can search about the disease, they think they are suffering from and compare the symptoms. I have been in that position before and ended up concluding that I was suffering from “Dimentia”!! However, after going through all the medical tests, I was declared healthy.

The statistics about US medical referral system (as discussed in the report) clearly reflects the inefficiency of general physicians in treating patients and smooth transfer of patient related information. Somehow, even if we come to know about the disease and google concerned doctors in the city, we will get plethora of doctors and we don’t know whom to trust.

That’s why, a platform which caters all the above-mentioned needs with a reliable query support system, is the need of the hour.

# 5. FUTURE WORK

Although almost every requirement stated in the SRS document has been covered, there is still a lot of scope for improvement, accuracy, reliability and ease of use.

As of now, we cater limited diseases and have a small list of concerned doctors. But since we aim to cover even remote suburb areas where basic health care facilities have not reached yet, we need to scale up and increase our network of specialised doctors.

Use of ML technology in disease prediction, without any doubt will improve accuracy. Recorded symptom history of patients and his family members will definitely play a significant role in predicting diseases using ML technology. This ML technology enabled prediction service will also help doctors in cross-verification. In this way money spent on irrelevant lab tests can be drastically reduced.

Just like separate “Login” and interface for “Patient” and “Admin”, there is a need to have such an interface for doctors too. Patients can schedule virtual/physical meeting with concerned doctors. After a meeting is scheduled, doctors can view past medical and symptoms history of the patients.

Apart from above suggested improvements, working on non-functional requirements like clutter-free UI and more reliable and responsive query platform will really add up to overall look and feel of the service.

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