



RED WINGS: A CENTRAL REPOSITORY FOR BLOOD DONATIONS

¹Yash S Sahare, ²Shruti B Sankeshware, ³Shweta S Patil, ⁴Pratik S Kakade, ⁵Pavan U Koli

¹²³⁴⁵Student

¹²³⁴⁵Department of Computer Science and Engineering,

¹²³⁴⁵Bharati Vidyapeeth's College of Engineering, Kolhapur, Maharashtra, India

Abstract: Red Wings: A Central Repository for Blood Donations is a Web-based Blood Donation Management System that enables individuals who want to donate blood to help the needy. It also enables hospitals/managements to record and store the data for people who want to communicate with them, and it also provides a centralized database. The system is developed by using HTML, CSS, JavaScript, Bootstrap, Express.js, Node.js, and MongoDB as a database system to manage and store the data. The Waterfall Methodology, which is the traditional version and the classic approach of a system development life cycle, is used to develop and build the web-based blood bank. The system targets three types of users: the public who wants to donate blood, the recipients who need the donated blood, and the hospitals/managements that work as an intermediary to manage the communication between the donors and recipients. The main objective of developing the website is to educate the community on the benefits of blood donation, develop a centralized system to establish a bridge between donors and recipients, and encourage voluntary blood donation, easily accessing any information.

Index Terms – Red wings, blood donation, blood bank, blood camp, blood donor, blood.

I. INTRODUCTION

Blood donation is the process of transferring blood from a healthy person to someone who needs it. It "occurs when a person voluntarily has blood drawn and used for transfusions and/or made into biopharmaceutical medications by a process called fractionation."

Blood donation is very important health care and blood is a very unique and precious resource because it only can be obtained from blood donors. Donors participate to save many human beings each year, although some still die or suffer because of the lack of access to a safe blood transfusion (WHO, 2010).

Blood is the "gift of life" that transfers from a healthy individual to others who are sick and in actual need of blood. In one hour, from one unit of blood, red blood cells can be extracted for use in trauma or surgical patients. The liquid part of the blood, which is called Plasma, is given to patients who have clotting problems. The third component of blood is platelets, which clot the blood when there are cuts and are often used in cancer and transplant patients. In a recent study supported by the National Blood Foundation, more than 5,000 individuals who were blood donors were asked why they donate blood, and three-quarters of the respondents answered that they give blood to help others and that giving blood makes them feel good about themselves (AABB, 2013).

Although the number of people who need blood is increasing and the availability of blood is decreasing there is no central Blood Bank that can manage blood donation.

Each hospital has its own Blood Bank and its procedures. Each Blood Bank is responsible for the management and control of transfusions and processing; it is also responsible for collecting the units and for the donor services.

The general idea of the study is to develop a centralized system to manage the records of the donors and the people who need blood. It educates the public on the benefits of blood donation to motivate them to donate blood for the people who need it. Millions of Indians need blood transfusions each year, some of them need blood transfusions to replace the blood lost during surgery or after having serious accidents that cause them to lose some of their blood. Others may need blood because of illnesses such as anemia, cancer, bleeding disorders, and disorders of the immune system (NIH, 2012). Doctors may give the person whole blood or part of the blood, depending on the person's condition. Some people need red cells only if they are anemic or if they lost a lot of blood after having a serious accident. For those who are bleeding too much during surgery, they need plasma, and for those who have cancer or a bleeding problem, they need platelets (Kids Health, 2012).

Red Wings: A Central Repository for Blood Donations is a web-based project which manages all services related to blood donations. The management has all services that can effectively collect the information about blood availability from blood banks and distribute the same to the needy. A person who wants to donate blood can visit our website and search for available blood camps, and blood banks for donation. The person, who needs a blood donor, can search and find available blood donors by using our website. Red Wings also provide a map facility that can guide the needy to find a blood bank or camp location.

The project consists of a central repository containing various blood deposits available along with associated details. It helps in maintaining and monitoring the blood deposits. The project is an online system that allows checking whether required blood deposits of a particular group are available in the blood bank or not.

The application is reduced as much as possible to avoid errors while entering the data. No formal knowledge is needed for the user to use this system. Thus by this all, it proves it is a user-friendly system. Red Wings can lead to an error-free, secure, reliable, and fast system. It can assist the user to concentrate on their other activities rather than concentrate on record keeping. Thus it will help the hospital/ blood bank/ organization in better utilization of resources.

II. LITERATURE REVIEW

2.1 Intelligent Blood Management System [2019]

Donors in India who want to donate blood can register at Intelligent Blood Management System after reading the basic constraints of donating blood. Intelligent Blood Management System requests the donor's name, password, and ID to allow the donor to access his account, which contains information about his date of birth, blood group, gender status, and weight, email ID, mobile no, city, address, state, and information about kidney, cancer and heart disease, and date of his last blood donation. After that, the people who need blood can browse the site and display the list of blood donors.

The intelligent Blood Management System allows recipients to search by area to have more reachable donors. The website provides the phone number to the recipients to make contact with the donor. Also, Intelligent Blood Management System provides information about Blood Donation, such as tips, scientific information, facts, etc. It selects other blood banks for blood donation. Intelligent Blood Management System offers these services for free. Further, the site doesn't use the collected information for any commercial purposes (Mitesh Sarode, Ayush Ghanekar, Sahil Krishnadas, Yash Patil, Manish Parmar, "Intelligent Blood Management System", Bombay Section Signature Conference (IBSSC) 2019 IEEE, pp. 1-5, 2019).

2.2 Blood bag: A web application to manage all blood donation and transfusion processes [2017]

It is a web-based blood bank management website that offers several services, including:

- The possibility of the donor registering online to donate blood.
- The possibility of citizens getting all the details about the donation camps.
- Help to provide blood supply for the different groups from other blood banks.
- The site has a benefit for citizens by conducting all operations through online services such as registration and searching for details of blood camps.

(Rehab S. Ali, Tamer F. Hafez, Ali Badawey Ali, Nadia Abd-alsabour (Cairo University, Egypt), "Blood bag: A web application to manage all blood donation and transfusion processes", 2017 International Conference on Wireless Communication, Signal Processing and Networking, WiSPNET)

2.3 Blood Bank Management System [2006]

India has an annual need of about 5.0 million units of blood each year. And, it collects around 3.50 million units per year. A blood-bank management system was designed to fetch blood donors and receivers through the shared software platform. Donors can register on the website and enter their information.

This system makes readily available, safe blood and other blood components, which can offer moral and accepted way, consistent with the long-term welfare of the community. That actively encouraged voluntary blood donations, motivates and maintains good records of indexed blood donors, and educates society about the advantages of donating blood. This also will work as a site for the interaction of best practices to reduce the unneeded use of blood and assist the State in achieving higher efficiency and self-sufficiency in the blood operation (Alexander, et al, 2006).

| Name | Place | Year | Author | Objective |
|--|-------|------|---|--|
| 1. Intelligent Blood Management System | India | 2019 | Mitesh Sarode, Ayush Ghanekar, Sahil Krishnadas, Yash Patil, Manish Parmar | It allows recipients to reach donors. It created a database of donors, classified by locality. Donors in India who want to donate blood can register, after reading the basic constraints of donating blood. Also, anyone can refer friends by just providing their email IDs. Blood recipients can browse the site and display the list of blood donors who are close to their locality |
| 2. Blood bag: A web application to manage all blood donation and transfusion processes | India | 2017 | Rehab S. Ali, Tamer F. Hafez, Ali Badawey Ali, Nadia Abd-Alsabour (Cairo University, Egypt) | Helps to provide blood supply to the different groups from other blood banks, provides service through online registration of blood donors, and gives news and details about blood donation events |
| 3. Blood Bank Management System | India | 2006 | Alexis Alexander CibiChacko Lekshmi V.R. Soumya P. Sadanandan | Developed a web portal to facilitate the interaction between the demand for blood and the provider. This system makes available safe blood and other blood components, which can offer moral assistance, consistent with the long-term welfare-being of the community. |

The purpose of Red Wings is to automate the existing manual system with the help of computer technologies, fulfilling their requirements, so that their valuable data/information can be stored for a longer period with easy access and manipulation of the same.

We have gone through some blood donation documentation/papers/websites which are available on the internet and tried to list down some important features which were missing in that system and overcome them in our website with some more extra added features.

Below are given the features which were missing in the existing systems and what new we are going to implement in our system.

Limitations of existing systems

- Lack of user-friendly experience.
- Not supported on all devices.
- Sometimes need to visit the facility physically.
- Manual working, the user has to manually change the donor status as available/ unavailable.
- Problem to managing huge data.
- Loss of data due to mismanagement.
- Retrieval of data takes a lot of time.
- Lack of data security

The proposed system includes the following features

- Allow online search for blood availability and blood donors in the respected area.
- Centralized system for blood bank, blood camp & blood donor.
- Google maps.
- Registration for a blood donor, blood bank, blood camp.
- Login for a blood donor, blood bank, or blood camp.
- Donor, blood bank, blood camp information management in database.
- Blood bag management.
- Blood camp management.
- Improve the effectiveness and efficiency of the blood bank/blood camp.

III. PROBLEM DEFINITIONS AND METHODOLOGY

3.1 Formalization of the problem

3.1.1 Statement of the problem

India with 138 crores of the population faces many blood-related problems such as scarcity of rare blood groups, unavailability of blood during an emergency, no proper/confirmed information on blood availability, less awareness among people about blood donation, and dealing with all these issues there is no any centralized system to overcome the problems. So we came up with a solution as Red Wings: A Central Repository for Blood Donations.

3.1.2 What are the problems people face?

Awareness about blood donation in India is sharply skewed. While some states, like Delhi, can accumulate 233% more extra blood than what is required, other needy states like Bihar face a deficit of as much as 85%. The cause for this wide difference in blood donation is primarily the lack of knowledge about its simple process in the lesser-developed states and the various unfounded myths that people have harbored over the centuries. On the whole, India today faces a shortage of 10% relative to its blood requirements. In absolute terms, this means that we require to cover a shortfall of over 12 lakh units. Given that the eligible donor population of India is more than 512 million, this deficit is surprising. But it also means that the shortage of blood supply can be covered within a day. If only we contribute.

3.1.3 Why chosen approach is better?

To overcome all these problems we decided to come up with an idea where the whole process will be centralized and will be a communication medium between blood banks, blood donors, blood camps, etc. The view is to provide a system for the user that will find out available bloodstock in blood banks, find blood donors, and search upcoming blood donation camps. The idea focuses on implementing a user-friendly website that can be used by the user to get the details related to blood donation. The user will be able to use the website from any desktop PC because of our responsive website. The proposed work aims to help users find out the appropriate information related to blood donation from anywhere on their fingertips and mainly not visiting the hospital or blood bank physically to get information as of now we are facing the Covid-19 pandemic and we are restricted to our houses. This system allows authorized users to access the website for its purpose.

IV. TECHNOLOGIES AND METHODOLOGIES

4.1 Technologies

4.1.1 Frontend

- **HTML**

HTML is an acronym that stands for Hypertext Mark-up Language which is used for creating web pages and web applications. We have used HTML as a building block of our website for all web pages.

- **CSS**

CSS stands for Cascading Style Sheets. It is a style sheet language that is used to describe the look and formatting of a document written in a mark-up language. For making our website more appealing we have used CSS. We have used external as well as inline CSS also.

- **JavaScript**

JavaScript is a very powerful tool that can do many things for a website. For one, it powers the site's general interactivity. JavaScript makes it possible to build rich UI components such as image sliders, pop-ups, site navigation mega menus, form validations, tabs, accordions, and much more.

JavaScript allows web pages to respond to user activity and dynamically update themselves, all without requiring a page reload to change its appearance.

A JavaScript framework can be a powerful tool you can use to help render the page. JavaScript is a very important tool for a front-end web developer. Without it, webpages wouldn't have become the dynamic web applications they are today.

- **Bootstrap 5**

Bootstrap is the most popular HTML, CSS, and JavaScript framework for developing a responsive and mobile-friendly website. It is a front-end framework used for easier and faster web development. It includes HTML and CSS-based design templates for typography, forms, buttons, tables, navigation, modals, image carousels, and many others. It can also use JavaScript plug-ins. It facilitates you to create responsive designs.

We have used bootstrap on our website for many purposes due to which our lot of work has been reduced by using bootstrap-built classes. We have used many bootstrap templates such as navbar, dropdown, carousel, cards, etc. We have also used many inbuilt CSS classes and we have also implemented many JavaScript features using bootstrap without writing any JavaScript code.

4.1.2 Backend

- **JavaScript**

JavaScript is a lightweight object-oriented programming language that is used by several websites for scripting the webpages. It is an interpreted, full-fledged programming language that enables dynamic interactivity on websites when applied to an HTML document.

We have implemented many JavaScript features in our website for validations and mainly for the backend of our project.

- **Node.js**

Node.js is a cross-platform runtime environment and library for running JavaScript applications outside the browser. It is used for creating server-side and networking web applications. We have used Node.js for implementing the backend of our project which needs very less code for implementation

- **Express.js**

Express is a fast, assertive, essential, and moderate web framework of Node.js. You can assume express as a layer built on the top of the Node.js that helps manage a server and routes. It provides a robust set of features to develop web and mobile applications.

4.1.2 Database

- **MongoDB**

MongoDB is a source-available cross-platform document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas. We have used MongoDB as our database to store and retrieve data for blood donors, blood banks, blood donation camps, etc.

- **Mongoose**

Mongoose is a JavaScript object-oriented programming library that creates a connection between MongoDB and the Express web application framework

4.1 Methodologies

We will use the waterfall methodology, which is the traditional version and the classic approach to the system development life cycle. It describes the sequential and linear development methods. The waterfall methodology has clear objectives and goals for each phase of the system development life cycle (Rouse, 2007).

The most important steps that have been taken to build the blood bank website are:

- **Initial stage**

- Identify the problem.
- Search for similar research, determine the objectives of each system, and then summarize it in one table.
- Determine system objective.
- Read the available literature in the form of reports and brochures.
- Distribute a questionnaire.
- Analyze the questionnaire results.
- Identify the individuals' requirements and preferences.
- Determine the project plan.
- Determine the hardware and software needed to build the website.
- Identify the users.

- **Design stage**

How the application looks will be defined and prepared from the requirement specifications that were analyzed from the questionnaire. The three designs that must be done in this stage are:

- Prototype Design.
- Database Design.
- User Interface

V. ANALYSIS AND DESIGN

5.1 System Architecture

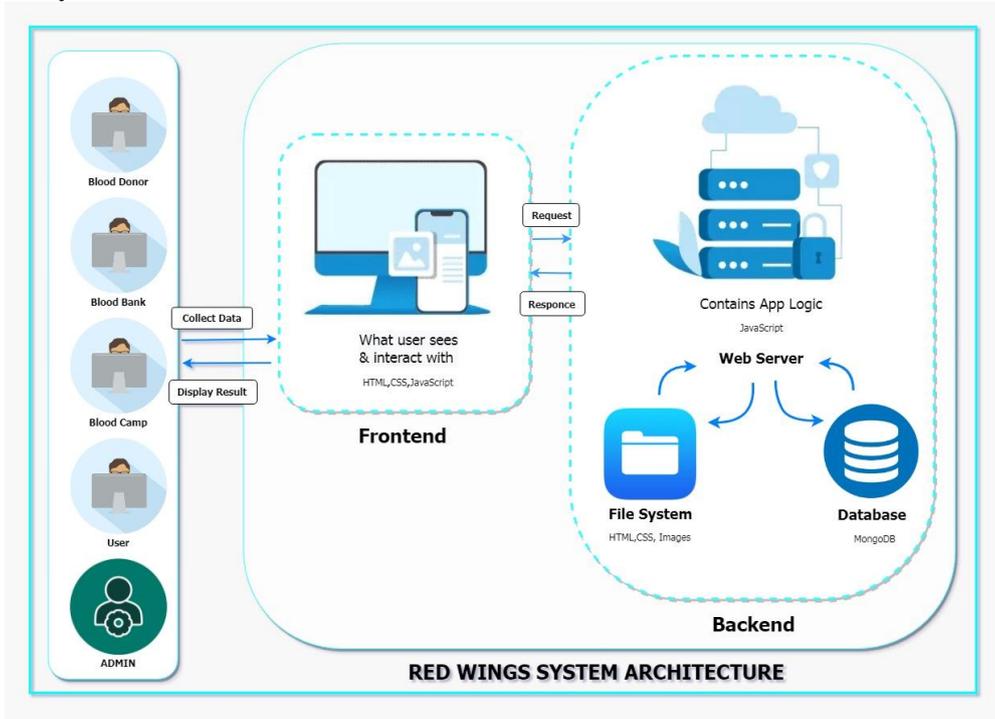


Fig.1

5.2 Design Module

5.2.1 DFD

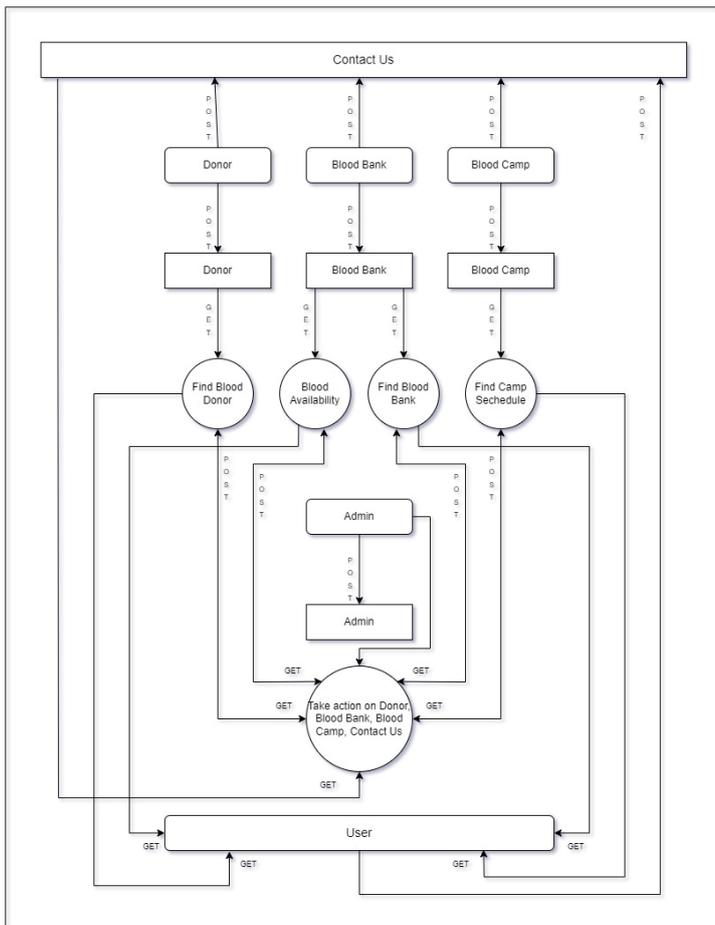


Fig.2

5.2.2 UML

5.2.2.1 Class Diagram

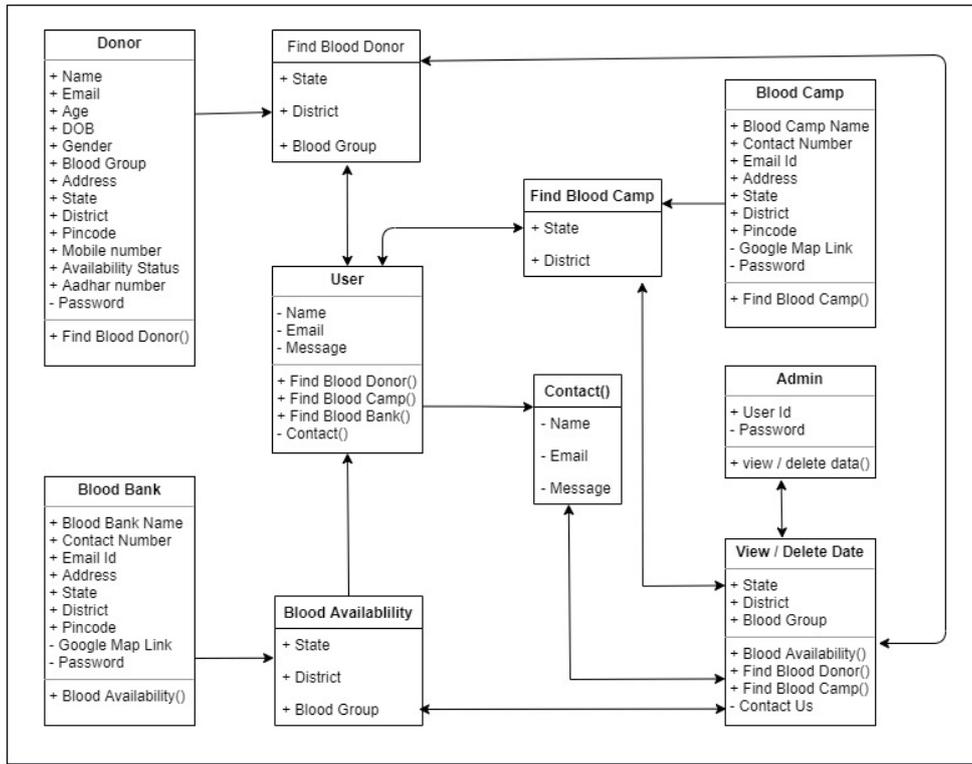


Fig.3

VI. EXPERIMENTAL RESULT



Fig.4

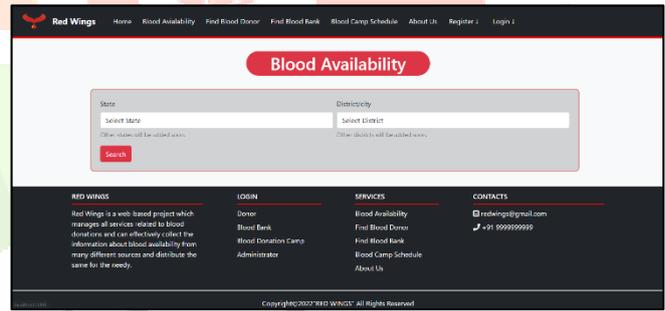


Fig.5

| Blood Availability | | | | | | | | | | | |
|--------------------|----|----|-----|----|----|----|----|---|--|---------------|---------------|
| Blood Bank Name | A+ | B+ | AB+ | O+ | A | B | AB | O | Last Modified | Mobile Number | Email Id |
| Sanghvi Blood Bank | 12 | 4 | 6 | 8 | 14 | 10 | 2 | 4 | Sun Jun 05 2022 10:27:08 GMT+05:30 (India Standard Time) | 7709336699 | sbb@gmail.com |
| CPE Blood Bank | 2 | 10 | 6 | 22 | 12 | 12 | 2 | 0 | Sun Jun 05 2022 10:28:11 GMT+05:30 (India Standard Time) | 2112644397 | cpb@gmail.com |

Fig.6

| Available Blood Donor | | | | | | |
|-----------------------|-------------|-----------------------|-----------------------|---------------|---------------------------|---|
| Donor Name | Blood Group | Available/Unavailable | Address | Mobile Number | Email Id | Report if details are incorrect |
| Yash Sathakar Salunke | O+ | Available | Maharajwadi, Kolhapur | 8554217388 | yashsathakar497@gmail.com | Reported for: 629c39561c0ee52811493e6 Type: Donor Your Email ID: Your Concern: |

Fig.7

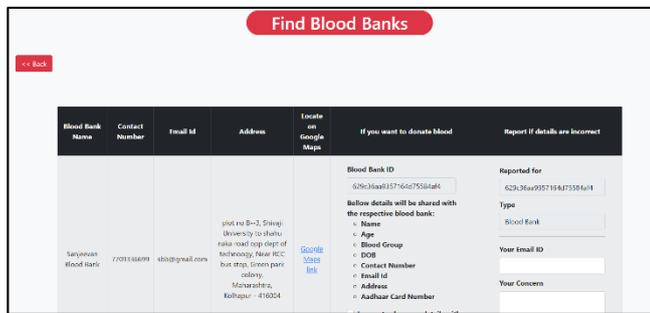


Fig.8



Fig.9



Fig.10

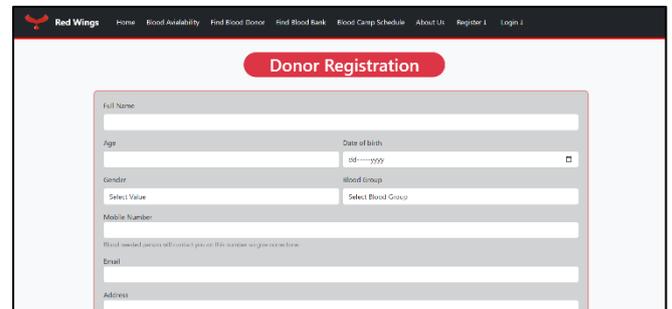


Fig.11

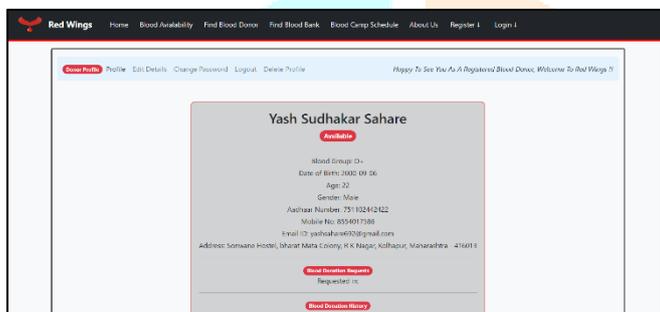


Fig.12



Fig.13

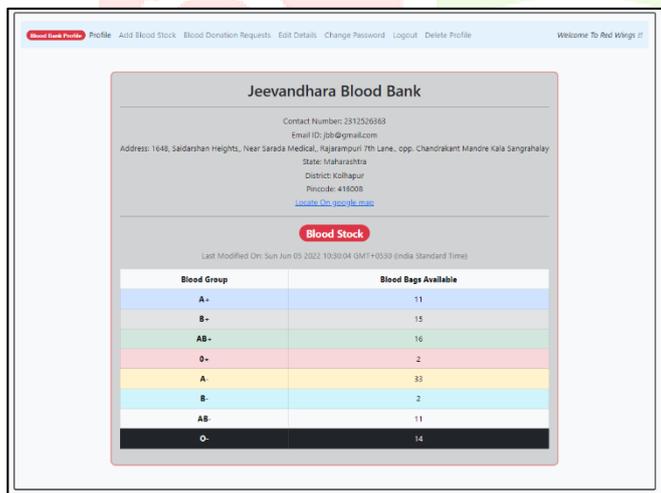


Fig.14

VII. CONCLUSION AND FUTURE SCOPE

Red Wings is developed using JavaScript, Express.js, Node.js, and MongoDB which fully meets the objective of the website for which it was developed. The website has reached a steady-state where all the bugs have been eliminated. The website is operable at its high level of efficiency and all kind of people who needs services related to blood donations can use Red Wings more efficiently. Red Wings tried to figure out all the existing problems with the help of a centralized facility to work as a bridge between hospitals, blood banks, blood camps, blood donors, and blood seekers. We will also try and solve future arising problems to make Red Wings better day by day.

VIII. ACKNOWLEDGMENT

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