Blood Bank System using Database Security

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Abstract

Despite the immense technological advancement, blood bank systems are either manual or valuable data is easily retrievable. Consequently, one of the major issues in blood bank systems, as talked about in many research papers and articles, is the lack of data security. People always doubt whether their personal information and medical records are safely stored and secured. Therefore, our project aims to develop an online blood donation system applying the concepts of database security and encryption.

The following is what our project aims to achieve: Any person who is willing to donate blood will have to register first, even if the user is a new donor, or the user can directly login if he/she has an account already. Whenever they want to donate blood, a form will have to be filled. In the user account, the user will be able to view all the details and records of all earlier donations as well as information about upcoming blood donation events. There will be a link provided to find blood donors in the region of the users' choice. All this is related to the blood bank system. Apart from this, we will be using concepts of database encryption to make sure that the users' information is kept secure and confidential. This will help us keep their donation records protected from any threats from individuals with potentially malicious intentions, or any unforeseen hazards to the security of the data.

Keywords: *Blood banks; Management Systems; Data Encryption; Healthcare; Data Security;*

1. Introduction

With blood being a universal requirement, it has become increasingly necessary for hospitals, clinics, and healthcare centers to have accessible measures aiding in the finding and acquiring of donors for recipients in urgent need of specific blood types. There is a lengthy process to accept blood from a potential donor and once the donor has been accepted, numerous personal details and information in regards to the donor are required. This information is generally stored in large databases that are often under-secured and easily hack-able, making it relatively simple to change, update, steal and misuse personal information of others. Moreover, in emergencies of blood requirements, the previous systems of accessing the database of donors is not efficient. Current manual mechanisms and vital sign documentations also have a number of inherent flaws, such as failure to document all appropriate observations, activities and inaccurate entry of data. It is time-consuming and costly. Accordingly, it would be beneficial if there was an automated system and method to remove all these imperfections [16]. In the last 10 years, the number of voluntary donors has been increased compared to non-remunerated donors. Though, there is an increased voluntary blood donor, because of the lack of information relating to bold donation, many people become disentitle to donating blood [17]. To organize blood donation campaigns, organizers need to go to the nearest blood bank to inform and get the necessary requirements to organize blood donation campaigns. It is more time consuming and difficult. Emergency patients, who need blood immediately, request blood through advertising on televisions or social media [19].

So, the need of automated and computerized blood bank management systems with the added benefit of database security is a major requirement. Adoption of big data in healthcare significantly increases security and patient privacy concerns. At the outset, patient information is stored in data centers with varying levels of security. Traditional security solutions cannot be directly applied to large and inherently diverse data sets [11]. Therefore, a new hypothesis for database encryption is proposed in which database encryption can be provided as a service to applications with unified access to encrypted databases. Using such an encrypted data management model, applications can concentrate on their core businesses and protect data privacy against both malicious outsiders and the untrusted database service users without need to know encryption details [12].

Hence to provide safe and secure storage of personal information of the donor and even the users, we came up with an innovative idea to create a website (Blood Bank Management System using Database Encryption). Blood Bank Information Management System is an information system which helps to manage the records of donors and patient at a blood bank. It is mainly designed to store, process, retrieve and analyze information concerned with the administrative and inventory management within a blood bank. Such kind of systems will allow the authorized blood bank officer to login using a secret password and easily manage the records of the blood donors and the patients in need of blood [18].

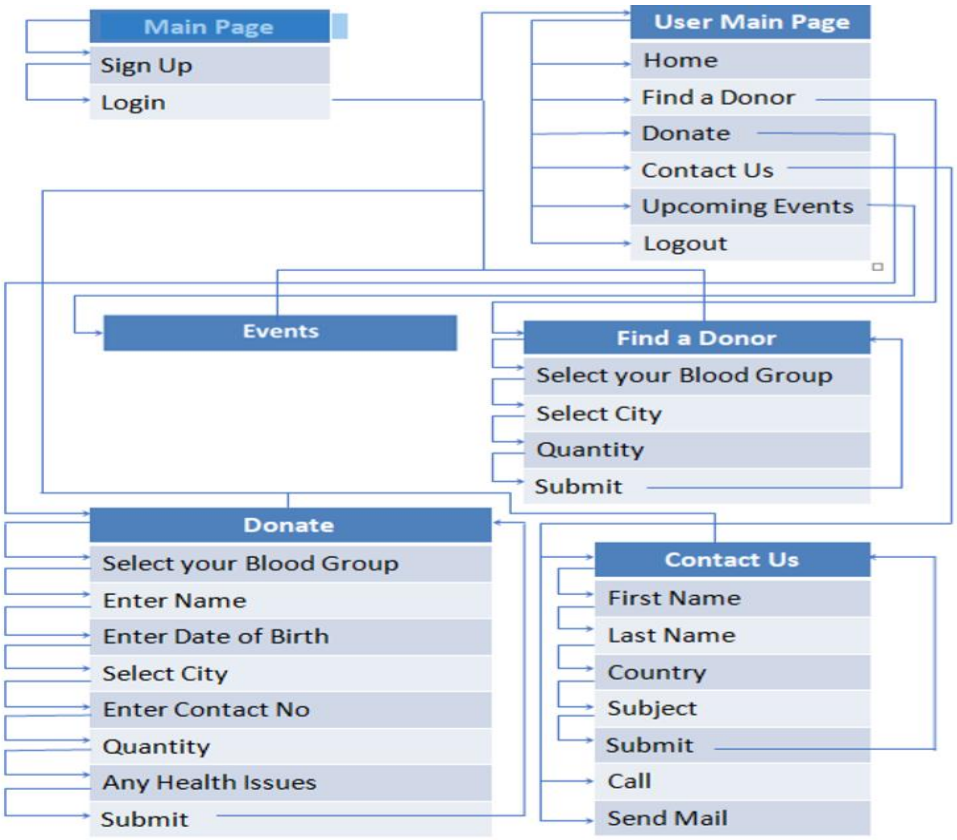


Fig. 1. Modular design of the proposed management model

2. Materials and Methods

In our application we aim to achieve high levels of data security using encryption algorithms and database management, therefore providing a secure alternative. This study focus on designing a new system to maintain donation process by providing computerized system that saves donor information and blood tests details, using a programming language PHP which is a server-side scripting language, and My SQL database which is a program that can store large amounts of information in an organized format that's easily accessible through scripting languages like PHP.

Fig. 1 describes how all the web pages are linked to each other on the web-application portal in accordance with all the services provided to the user. A user who doesn't have an existing account has to first create an account through the sign up option on Main page and then can login to access other facilities. The user is then directed to the Homepage where they get access to other options such as: a donor can go to the Donate page, or can visit the Events page to know about any upcoming events and, a patient can find a donor in case of emergency. If they have any queries related to our website or other processes, they can also contact us

2.1. Data Security

The healthcare industry is innovating and adopting new technologies to keep up with the exponential growth in the global acceptance of automation and digitization. The Information Technology sector is being widely accepted, often used to assist both doctors and patients to improve healthcare services. One of the most important sections of a hospital information system today, is the Electronic Health Record, where personal patient information is stored. There are countless number of applications used by hospitals, healthcare industries where patients use various health monitoring applications and devices to monitor their vitals and communicate with doctors through mobile and wireless technologies. As computers have become an essential part of our daily lives, it has become increasingly important for data security. Attacks over the Internet are becoming more and more complex and sophisticated. How to detect security threats and measure the security of the Internet arises a significant research topic. For detecting the Internet attacks and measuring its security, collecting different categories of data and employing methods of data analytics are essential [32]. Protecting the confidential/sensitive data stored in a repository is actually the database security. It deals with making database secure from any form of illegal access or threat at any level. Database security demands permitting or prohibiting user actions on the database and the objects inside it [12].The need to protect confidentiality and avoid unauthorized disclosure is relatively well understood in healthcare, and is driven by the desire to avoid breaches of sensitive information. In healthcare, the confidentiality of sensitive information must be protected end-to-end while the data is stored, used, and exchanged [35].

In the healthcare industry, the importance of data security spreads across a wide use from securing access to interfaces and computer systems that store private data such as medical records to ongoing research developments and confidential hospital information. The extensive digitization of information in the healthcare sector has improved healthcare services by making them fast and efficient, but it has also allowed real risks involving data being accessed by the wrong people. Given the sensitivity of data in healthcare, it is necessary to have robust and reliable information security systems and services in place at all times. Two-factor authentication and One-Time passwords are widely used across several other industries and are now implemented in healthcare forums. The data collected from data providers may contain individuals' sensitive information. Directly releasing the data to the data miner will violate data providers' privacy, hence data modification is required. On the other hand, the data should still be useful after modification, otherwise collecting the data will be meaningless [33].

Data Encryption is a method that involves storing data in an unreadable and illegible manner, keeping it confidential so that unauthorized individuals cannot access or use the information, even if they are able to find the information in a database or network. Healthcare organizations are constantly receiving, managing and distributing large amounts of medical and personal information which must be kept confidential to outsiders. Encrypting data before sending or storing it can reduce security breaches to a minimum.

2.2. Algorithms and proposed system

In our project, a person who is willing to donate blood will have to register first, or the user can directly login if they already have an existing account. When they enter their password, it will be encrypted by the hashing method. Whenever they want to donate blood, a form will have to be filled. The details entered by the user will also be encrypted using their username as a key, then storing it in the database. The user can view the information about upcoming blood donation events and also contact the admin if they have any queries. There will be a link provided to find blood donors in the region of the users' choice. Apart from this, we will be using concepts of database encryption to make sure that the

users' information is kept secure and confidential. We have designed our own algorithm for the same. This will help us keep their donation records protected from any threats or breaches from individuals with potentially malicious intentions, or any unforeseen hazards to the security of the data.

We will be using Application Level Encryption to encrypt the database. In the application-level encryption, the process of encrypting data is completed by the application that has been used to generate or modify the data that is to be encrypted. Essentially this means that data is encrypted before it is written to the database. This unique approach of encryption allows for the encryption process to be tailored to each user based on the information (such as entitlements or roles) that the application knows about its users.

If encryption and decryption is done within the application, sensitive data (including the key) is never revealed outside of the application server. An individual would have to compromise both the web server and database server to access all of the data stored. Given that the data is encrypted before it is written to the server, a hacker would need to have access to the database contents as well as the applications that were used to encrypt and decrypt the contents of the database in order to decrypt sensitive data. One of the most important advantages of application-level encryption is the fact that application-level encryption has the potential to simplify the encryption process as a secondary encryption tool will not need to be integrated into the system.

2.3. Comparisons with other methods

There are several issues that can be seen in already existing blood bank databases and systems. Issues in applicability of the system to various health centers and hospitals, as one solution is given, keeping in mind the obstacles faced in the blood bank environment of particular infirmaries [1]. A major concern is that of donor information security and encryption. This is an issue, as willing people hesitate in donating blood due to a feeling of insecurity. Accessibility to blood resources from the required location is an unresolved problem which needs an appropriate solution, as the lives of millions depend on whether or not the required type and the quantity of blood is available at the right times. One problem that remains to be addressed is the spreading of awareness about the time, venue and need for various blood donation events that take place.

As we all understand the rising importance of sustainable resources, systems that address the issue of shortage and wastage of blood units are in demand and need. This matter has been partially solved in the existing system "A Novel Technique for Online Blood Bank Management" [2]. There is also a system in which to remove the communication barrier direct call routing technique using Asterisk hardware is applied which also tackles fake callers, fake donors, follow up communication with the donor. However, privacy regarding the personal information of the donor or the user is not secured [13].

We compared our approach with other systems that have developed unique solutions to problems such as overcoming the communication barrier between the needy and the donors, by directly forwarding the call to a suitable donor or reaching the willing donors through SMS, using automatic call routing [3], interconnecting blood banks, hospitals and donors into a single network and storing various data and information of blood and health records of individuals to find nearby hospitals online instantly by tracing its location using GPS [5].The proposed system ensures that the blood donor can find out the nearest blood banks available according to his or her current location based on the GPRS feature used in the system, and also tries solving the issue of blood wastage; however other important issues like donor information security and encryption, and spreading awareness about the need to donate blood have not been given importance they require [4]. Aiming to design systems such that hospitals have availability of blood bags anytime, supports fast searching and manage information about the donor however not considering blood donors, patients/recipients as users and even the system excluded the consideration of system security measures [6].

We came across an android based project [8], where the Apriori algorithm was used, which is an algorithm that is useful in mining frequent item sets and relevant association rules. It mainly focused on web applications for blood donation management, managing blood donations and controlling blood transfusion processes [14]. A research proposed in [43], researchers developed a framework for centralized data that stored the data collected from several sensing units. This research aims to ensure the privacy and confidentially of the system. They used two cryptographic methods. The attribute based and the functional encryption methods, where they were combined together. Authors proposed an authentication schema for securing healthcare systems. It is basically two security protocols that have been proposed [42].

Virtual blood banks are the computer-controlled, electronically linked information management systems that allow online ordering and real-time, remote delivery of blood for transfusion. Thus,

the virtual blood bank can help ensure that the right patient receives the right amount of the right blood component at the right time [15].

Another already existing system helps control a blood transfusion service and create a database to hold data on stocks of blood in each area as data of donors in each city [9]. Although the systems mentioned above stores information about blood transfusion services in a database, it does not specify any information about security of donor details and other data. The project aims to provide all the functionality related to blood stock. Blood stocks will be managed by an administrator and the user will be able to see the blood stocks [10].

Several existing blood banks have been extensively compared [7] and have stated that the automation and digitization of things have become a normal and if most information, products and services are available with the click of a few buttons and keys, then it is only appropriate that healthcare services be among those offered. The digitalization of things has become a need-base for the functioning of man-kind and with that comes several aspects of sensitivity to information and privacy. The requirement of security across all fields of medicine is rising globally as more industries take their businesses online and increase their susceptibility to malicious threats and security violations.

3. Objectives and Motivations

The main purpose of a secure online blood bank system is to simplify and automate the process of searching for blood in case of emergency and maintain the records of blood donors, recipients, blood donation programs and blood stocks in the bank in a safe, secure manner.

To assist in the management of blood donor records, plan and share information in a more confidential, secure and convenient way using database security. To allow a quick and timely access to donor records. The benefit of easy registration and participation in any upcoming events aims to encourage more volunteers to take part in such activities. The current donation camp locations will be available to users in different areas.

There are several reasons behind implementation of project; manual systems being used in blood bank management systems are time consuming and are prone to mistakes, the lack of data security i.e. no centralized database used to keep donors' records makes it an unsafe way of storing private information and the percentage of accuracy is less in manual systems than digitized systems. Another reasons of implementation is in order to provide authentic and authorized features to current systems where private and confidential data can only be viewed by authorized users. To propose a one web-based application where blood donors can register themselves to donate therefore eliminating the drawbacks of the existing system problem i.e. database insecurity.

3.1. Business Model Canvas

The key features of the proposed application system are highlighted below in Fig.2.

3.1.1. Key Partners

Our main partners and suppliers are healthcare facilities such as hospitals and clinics, organizations that help in acquiring volunteers for blood donations such as Red Cross and individual volunteers. Another main partner includes those in need of blood (patients).

3.1.2. Key Activities

Our website helps organizations or individuals find the required blood in an appropriate amount of time and any individual that wishes to donate his/her blood can easily make use of our website. Data is encrypted and stored resulting in the security of ones' personal information. Moreover, it also notifies users about any upcoming or ongoing blood camps across the nation.

3.1.3. Key Resources

Website management is a key resource of our blood bank management system so as to ensure servers are working properly and individuals or other hospitals / pharmacies are able to get the required information on time with no issues related to accessing data. Teams organizing blood donation camps act as a key resource as well because they should provide their information to the website manager prior to conducting the event so that it can be mentioned and available to every citizen.

3.1.4. Value Propositions

Our website provides numerous services to the citizens and organizations such as storing their data into the database in a secure, encrypted form to prevent any hacks and finding the required blood in any required location in a sufficient quantity. It is easy to use and can be accessed anywhere anytime provided that one has registered and signed up before using. The website is made keeping in mind the level of every citizen so it is easy to maintain and is simple to understand.

3.1.5. Customer Relationships

Customers can call us or contact us via the website's Contact page when in need of any help. Their personal information is encrypted and saved in the database keeping in mind that their information is valuable and privacy is of the utmost importance.

3.1.6. Channels

There are several channels we are and would like to be linked to such as hospitals, pharmacies and other places which provide any medical or healthcare services. We would also like to have channels with many other websites related to similar work such as NGO's so that people around the entire country can make use of it from anywhere.

3.1.7. Customer Segments

All the members of society across India can be a part of this. However, our initial target is to cover the urban and semi urban areas of population and slowly extend it to rural areas as well. The reason behind mainly targeting the urban area is that the density of population in a city is much higher and people are more associated with the use of internet as compared to rural areas. We will make sure that people in rural areas also reap the benefits of this system with ease so that these people can also get help and help others in need.

3.1.8. Cost Structure

The website bears the cost of buying server space, domain space and renewal values. Even blood donation camps being organized requires the fund to conduct successful events. Promotions and referrals' fee is also required for the website to work efficiently and to make accessible to everyone. Moreover, anyone using it requires the use of internet therefore they have to make sure they have required data or Wi-Fi to use. So, cost for internet and phone is also required.

3.1.9. Revenue Stream

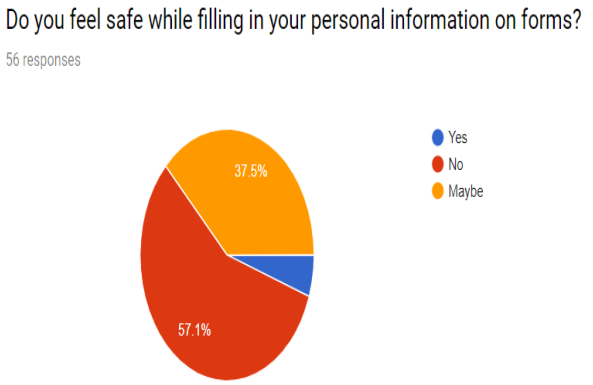
We have several revenue streams such as online advertisements on apps and websites. There is a usage fee for kiosks placed in hospitals and public places and a customer acquisition fee from stores and medical labs too.

<table>
<tr>
<td rowspan="2">Key Partners
Blood Banks
Hospitals / clinics
NGOs associated with Blood Donations (Red Cross)
Pharmacies
Prospective / Repeat Voluntary Blood Donors
Recipients / Patients
Health and Wellness Programs</td>
<td>Key Activities
Organizing Blood Camps
Website Development
Encrypted, custom Donor Profile
Blood Donor/Recipient query and support Contact</td>
<td rowspan="2">Value Propositions
Creating an Encrypted Database for voluntary blood donors
Patients find the right blood donors from database
Patients request blood units required and identify prospective donors
Pre-registration via Website
Can be accessed anywhere, anytime
Easy to use and understand</td>
<td>Customer Relationships
Users' personal information is all securely encrypted before saved to the database
Patients can see their requests
Call support via the Contact Us webpage</td>
<td rowspan="2">Customer Segments
All members of society across India
Initial target in urban and semi-urban areas of population</td>
</tr>
<tr>
<td>Key Resources
Website management
Server maintenance
Teams to organize blood donation camps
Relationship Managers to connect to hospitals / blood camps</td>
<td>Channels
Kiosk as Hospitals
Pharmacies
Website</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Cost of buying server space, domain space and renewal values
Utilities amount (Phone and Internet)
Cost of organizing blood donation camps
Promotions and Referrals' fee</td>
<td colspan="3">Revenue Streams
Revenue from customer acquisition fee from stores/labs
Online Advertisements in Apps and Websites
Usage fee for kiosks</td>
</tr>
</table>

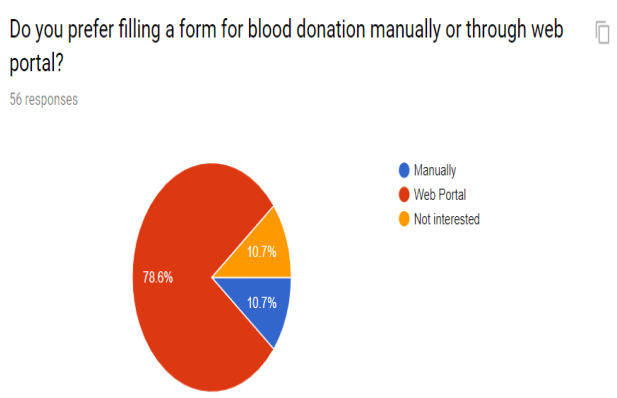
Fig. 2. Business Model Canvas of the system

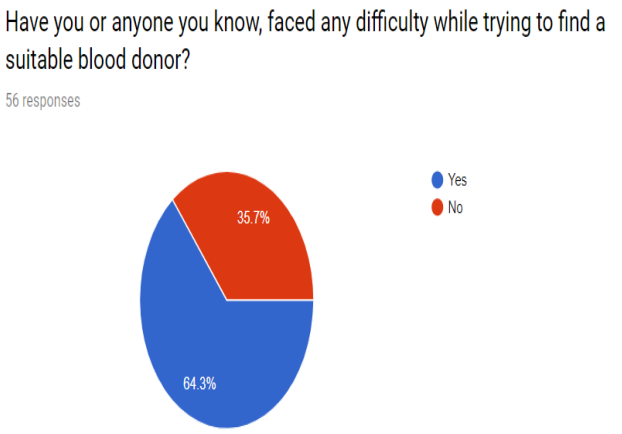
4. Literature Review

There is some research on automation of blood donor database. Because for efficient blood donor recruitment different factors are to be considered and different researchers used different factors in the recruitment process. AlRashdi et al. (2018) assessed some factors that influence the levels of recruitment for blood donations in Saudi Arabia and few people intend to give voluntary blood transfer and most of the past donors had to donate in unavoidable situations [21]. Angeline R expects to make a web application known as GPS based online blood Bank Management system using DMS. This app has the client's area that can be followed utilizing GPS framework [27].Finck et al. (2016) did a study on the factors of motivation and deterrents of blood donation among high school blood donors [24]. Ferguson (2015) used MOA approach in the case of recruitment of blood donor, suggesting financial incentives in forms of gifts and movie tickets are efficient in blood donation [22]. Alfouzan (2014) did a research to measure the level of knowledge on blood donation, to identify positive and negative attitudes, find the obstacles, and suggest some motivational factors more over some education hprogram arrangement to increase awareness of the range of people [23]. Bani et al. (2014) accessed the reasons of gender gap sampling donors who stopped donation at least two years before the study and also analyzed frequency of donation [26]. Arif et al. (2012) used last date of blood donation, BMI and last date of contact between donor and receivers in an asterisk technology based automated blood donation system as recruitment factors in their work [25]. P. Priya and V. Saranya have proposed an efficient and reliable blood donor information and management system based on GIS integrated in android mobile application [28]. The paper by Vikas Kulshrestha describes about the benefits of management information system in blood bank. The paper is basically focused on the blood bank management information system. It discusses about the beneficiaries of the blood bank management information system [29]. In the paper they have bought a new solution blood bank management which is called the Centralized Blood Bank Repository (CBBR). This new system will be a website hosted on an apache web server. The overall architecture is centralized. Here, the system is deployed in a central server while being accessed and collecting data from browsers on different devices in distributed areas [30]. An interesting approach by Jeroen Benien and Hein Force (2012) is that of supply chain management for blood and blood products terming the process as irregular and the demand for blood stochastic. This is of great implications if the management of blood banks were to become effective [31]. We bring attribute-based encryption with non-monotonic access structures and fine grained attribute revocation into m-healthcare cloud computing system, which can flexibly achieve the target that we want to [36]. Health-related information is very critical to patients' lives; a good advice from a well-behaved doctor may be used to improve a patient's health condition significantly, while following an inappropriate instruction from a misunderstood person may put the lives of patients in danger [37]. The patients can receive fast and accurate healthcare services from senior doctors, and meanwhile doctors are able to timely check the feedbacks from their patients [38]. He proposed a framework for electronic health record sharing that provides patients with the fine-grained control on the private information. The framework also uses the attribute-based techniques to improve the communication efficiency [39]. Since the applications of Online Social Networks (OSNs) currently dominate the internet users, it is unsurprisingly that the security and privacy preservation of these applications has been paid a great attention so even we are trying to make an application like that [40]. As personal health information is digitized, transmitted and mined for effective care provision, new forms of threat to patients privacy are becoming evident. In view of these emerging threats and the overarching goal of providing cost effective healthcare services to all citizens, several important federal regulations have been enacted including privacy



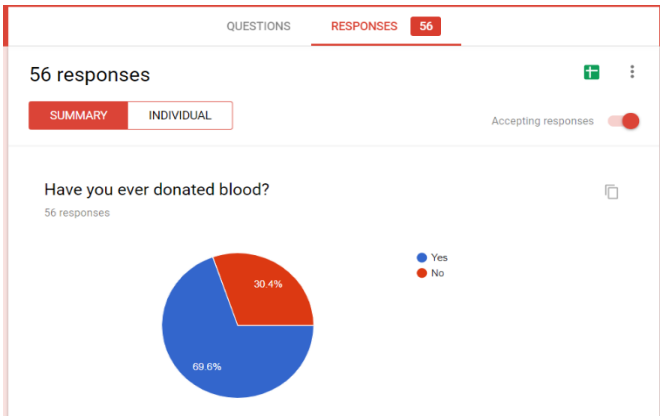
[41]. Healthcare applications are very critical applications and medical data are very critical and complex to be secure than other type of data and applications because it needs to be highly secured. There are many types of threats that may affect healthcare applications which differ in their causes and differ in their solutions [44]. Human error or failure can be prevented with appropriate security education, training and awareness programs. Therefore, this study has proven useful in identifying critical threats to human mankind, and could be useful especially for information security officers or policy maker to get clear understanding in order to design and implement effective security systems and policies [45].

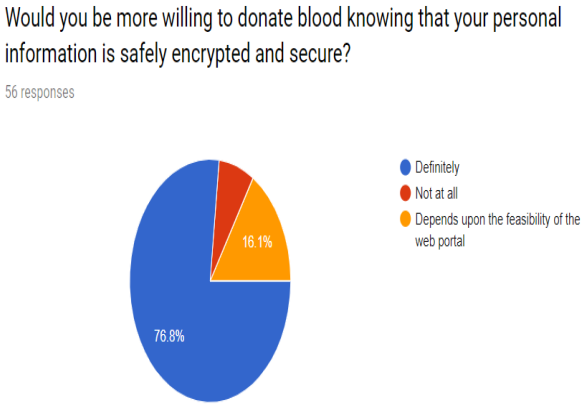




5. Results

After conducting a small survey, we were able to conclude that there are several people who are willing to donate their blood. However, the sensitivity and privacy of their personal information makes them wary of donating. We've proposed the idea of making a system which will ensure data protection with the mechanism of database encryption. Providing such systems to healthcare industries can make a user more comfortable with using online portals safely, increasing the number of volunteers donating their blood. The results of the survey are shown. We have also provided pictures taken from the actual website.





Website Screenshots

Fig. 3. Website Main page

Fig. 4. Homepage

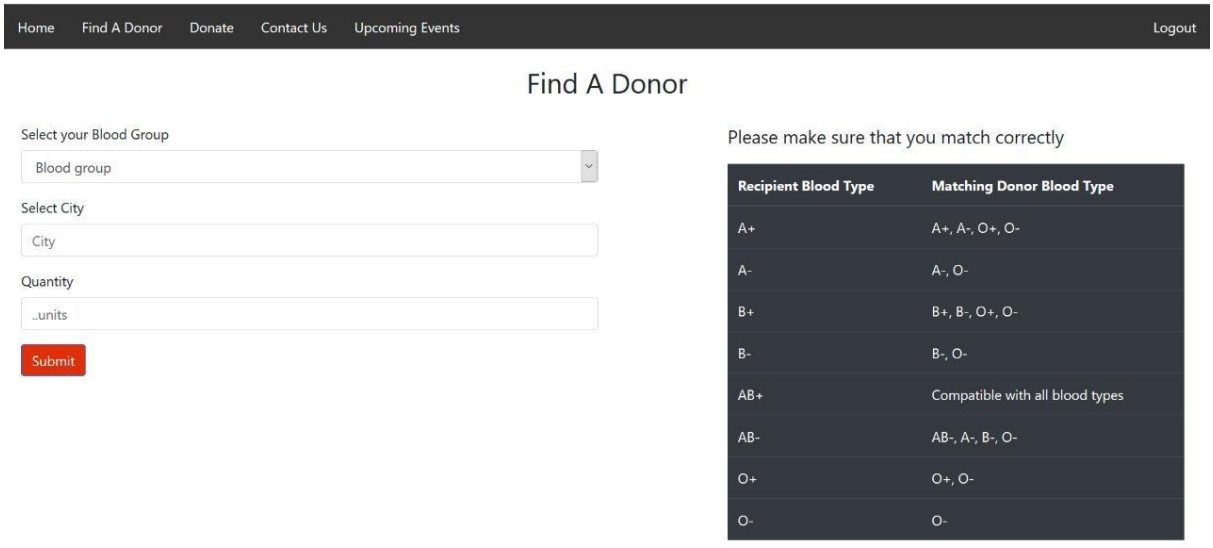


Fig. 5. Find a Donor page

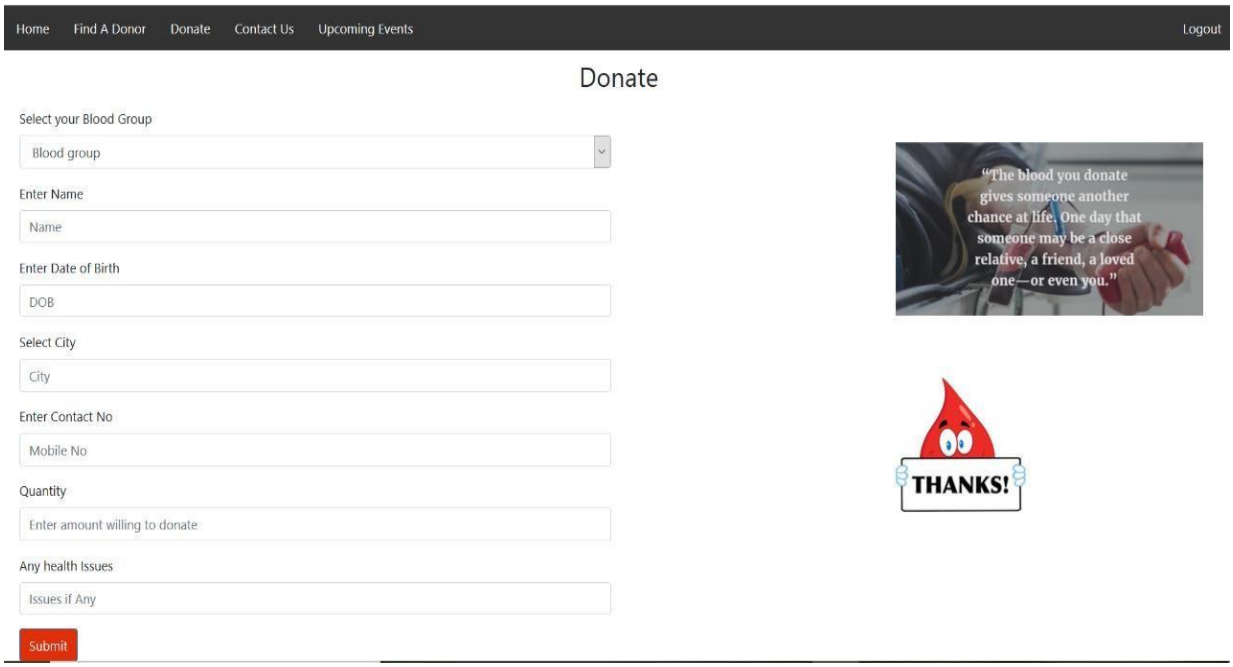


Fig. 6. Donate page

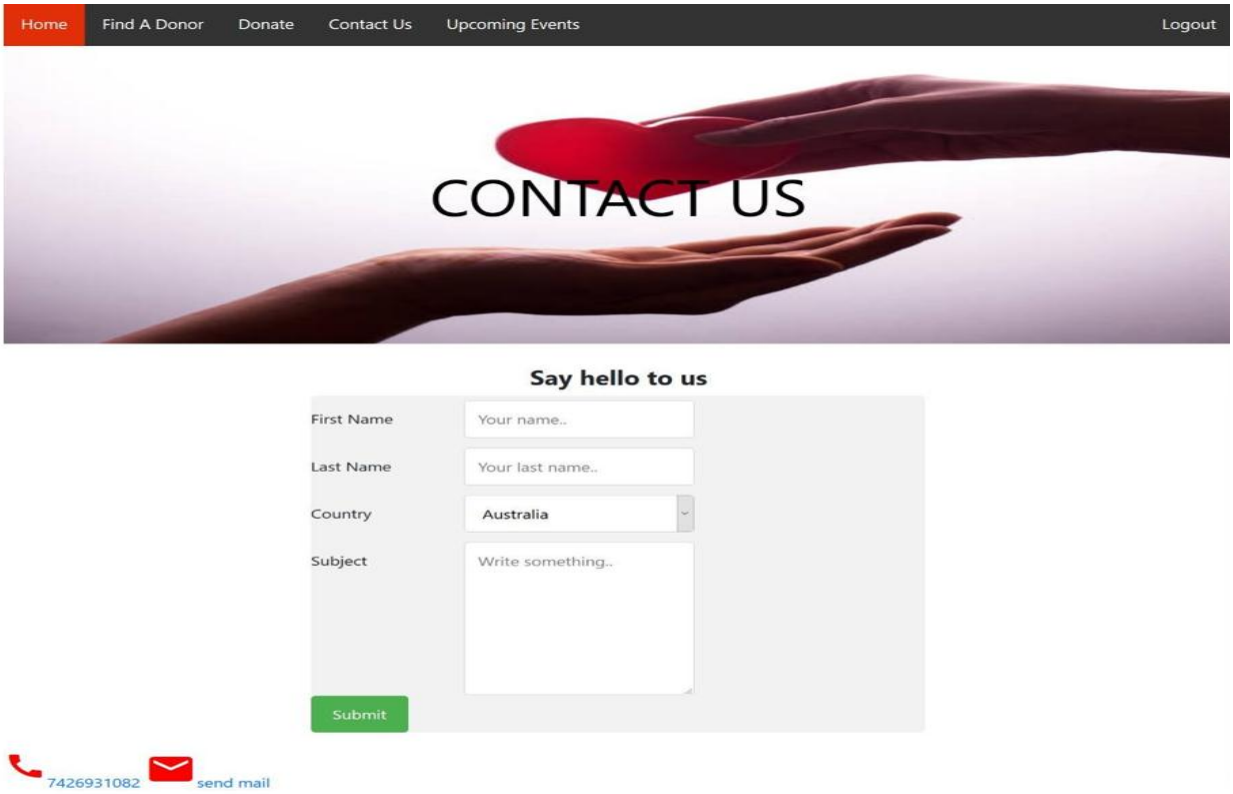


Fig. 7. Contact page

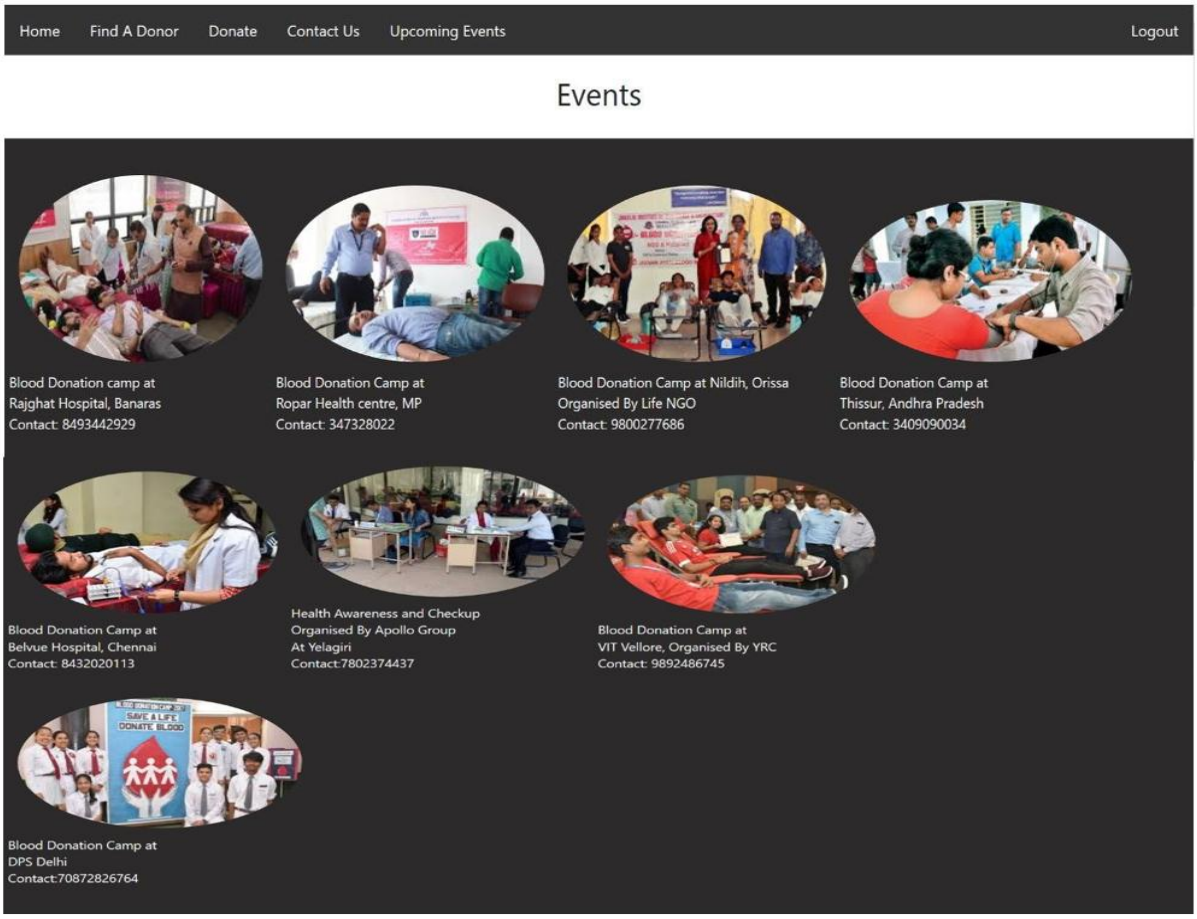


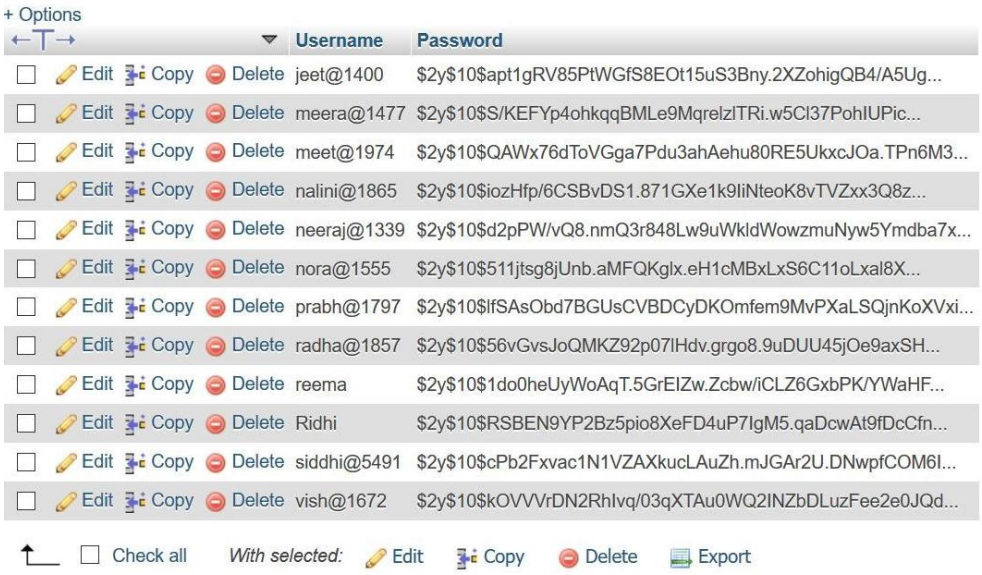
Fig. 8. Events page

+ Options

	Blood_group	Name	DOB	City	Contact_No	Health_Issues	Quantity
Edit Copy Delete	7943	krnow]	2000-01-26	nklknowrK	@?>=<;?<>C	vvx	450
Edit Copy Delete	6643	kr}K	2000-02-04	o|yvvo€	:CBA@?>=<;	oxyx	100
Edit Copy Delete	7943	or|wZ	1985-12-17	s€}zou|oP	A@BFEBDEFG		350
Edit Copy Delete	6545	o|pnW	1972-03-11	„|{xp,Y	BFDC@=B?EF	r{|{	300
Edit Copy Delete	656643	s|w{oX	1987-04-23	s€}zzsd	?>E>B@EFFG	oqw,owqa	180
Edit Copy Delete	6545	s}{€„s,	2001-01-01	s„svvsˆ	FJDKDBBFJI	w€€	100
Edit Copy Delete	7943	tŒ|…c	1999-12-25	…ˆƒzta	EDGJKKJJJL	,	430
Edit Copy Delete	656645	xƒu|y^	1985-03-13	yqr}…]	EEDIHHDFGI		380
Edit Copy Delete	7943	[ZV[D	2000-02-16	da[^Si9	&%$#"$+)%*	S[bak?	80
Edit Copy Delete	6645	_WdB	1983-01-14	[Z^W6	$)(%#++"++	dWV^gaZE`Wlad8	360
Edit Copy Delete	7943	~|oly\	1986-05-13	nklknowrK	:;?>BCC<CC	oxyX	450
Edit Copy Delete	6643	~‰wo	1978-06-12	wŠw,…a	FLOMJIMLOO	‰{‹‰‰6…„	270
Edit Copy Delete	6543	†nU	1990-09-21	yn}|uO	F>@==BEFFF	zryo|]-nrU	200
Edit Copy Delete	7945	‡€o[	1989-11-03	wo||svQ	@EAGBED@GG	s|}\	400

Check all *With selected:* Edit Copy Delete Export

Fig. 9. Encrypted Donor Table

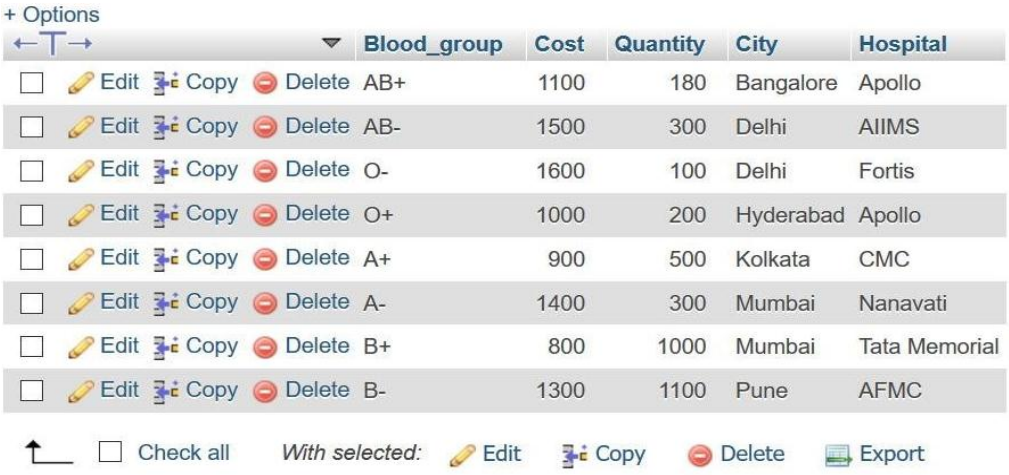


+ Options

	Username	Password
Edit Copy Delete	jeet@1400	$2y$10$apt1gRV85PtWGfS8EOt15uS3Bny.2XZohigQB4/A5Ug...
Edit Copy Delete	meera@1477	$2y$10$S/KEFYp4ohkqqBMLe9MqrelzlTRi.w5Cl37PohIUPic...
Edit Copy Delete	meet@1974	$2y$10$QAWx76dToVGga7Pdu3ahAehu80RE5UkxcJOa.TPn6M3...
Edit Copy Delete	nalini@1865	$2y$10$iozHfp/6CSBvDS1.871GXe1k9IiNteoK8vTVZxx3Q8z...
Edit Copy Delete	neeraj@1339	$2y$10$d2pPW/vQ8.nmQ3r848Lw9uWkldWowzmuNyw5Ymdba7x...
Edit Copy Delete	nora@1555	$2y$10$511jtsg8jUnb.aMFQKglx.eH1cMBxLxS6C11oLxal8X...
Edit Copy Delete	prabh@1797	$2y$10$lfSAsObd7BGUsCVBDCyDKOmfem9MvPXaLSQjnKoXVxi...
Edit Copy Delete	radha@1857	$2y$10$56vGvsJoQMKZ92p07IHdv.grgo8.9uDUU45jOe9axSH...
Edit Copy Delete	reema	$2y$10$1do0heUyWoAqT.5GrEIZw.Zcbw/iCLZ6GxbPK/YWaHF...
Edit Copy Delete	Ridhi	$2y$10$RSBEN9YP2Bz5pio8XeFD4uP7IgM5.qaDcwAt9fDcCfn...
Edit Copy Delete	siddhi@5491	$2y$10$cPb2Fxvac1N1VZAXkucLAuZh.mJGAr2U.DNwpfCOM6I...
Edit Copy Delete	vish@1672	$2y$10$kOVVVrDN2RhIvq/03qXTAu0WQ2INZbDLuzFee2e0JQd...

Check all With selected: Edit Copy Delete Export

Fig. 10. Encrypted Login Table using Hashing



+ Options

	Blood_group	Cost	Quantity	City	Hospital
Edit Copy Delete	AB+	1100	180	Bangalore	Apollo
Edit Copy Delete	AB-	1500	300	Delhi	AIIMS
Edit Copy Delete	O-	1600	100	Delhi	Fortis
Edit Copy Delete	O+	1000	200	Hyderabad	Apollo
Edit Copy Delete	A+	900	500	Kolkata	CMC
Edit Copy Delete	A-	1400	300	Mumbai	Nanavati
Edit Copy Delete	B+	800	1000	Mumbai	Tata Memorial
Edit Copy Delete	B-	1300	1100	Pune	AFMC

Check all With selected: Edit Copy Delete Export

Fig. 11. Blood Bank Table

Show all | Number of rows: 25 Filter rows: Search this table

+ Options

Blood_group	Rname	Gender	Age	Hospital	Units_received
O+	Meera	F	24	Lilavati	450
O+	Meet	M	57	Apollo	900
AB+	Nalini	F	65	Sanjivani	1200
O-	Nora	F	76	Sahara	1100
B-	Neeraj	M	84	Gujarat State	750
A+	Jeet	M	87	Taravati	1600
O-	Vishwanath	M	34	Jeevan	700
B+	Prabhakar	M	47	Malti	850
AB+	Siddhi	F	54	Hamida	550
A-	Radha	F	72	Jagannath	1000

Fig. 12. Recipients' Table

Fig. 3 is the display of the website's main page. Here, the users can either login in or sign up in case they are using it for the first time and then can get access to other web pages by logging in.

Fig. 4 is the Homepage where the user can navigate to all the other available web pages such as: Find a Donor, Contact, and Events and can also go to the Donate webpage to donate their blood if he/she wishes to.

Fig. 5 is the Find a Donor page where the user, in case of emergencies, can search for the required blood units and blood groups in the system and it will display the available units, name of hospital and the cost to the user.

Fig. 6 shows the Donate page where the user can volunteer to donate their blood by filling out the form. The details of the donor will be encrypted and saved so that their details are safe.

Fig. 7 shows that the user can contact the admin in case of any queries. They also can drop a message through subject box and submit or send a mail if they have any issues.

Fig. 8 shows that the user can view and know the details regarding the events being organized in the future. They can also visit and participate in these events as volunteers.

Fig. 9 shows that the data entered by the donor is encrypted and stored in the database. The encryption technique used is symmetric key encryption. The algorithm uses the username of the user as the key and then computes to get the encrypted value.

Fig. 10 describes the login table where the passwords have been saved using hashing so that user can feel free to provide their information

Fig. 11 is the table storing data which includes cost, quantity, city and hospital in which we can find the required blood group.

Fig. 12 shows the table which contains the data and information regarding the recipients in hospitals.

6. Discussions

Implementation of IT technologies in the healthcare facilities has raised protection and security fears. Privacy and security risks are a concern due to hackers, identity theft, illegal access and modification of patient data. Security practices include management processes for detecting and mitigating information risks as well as the implementation of technical safeguards. Many healthcare organizations follow a responsive path of implementing technical stopgaps because information security has been considered to be largely a technical issue Data without encryption mechanism may provide direct access to data with its original content [46, 49].Therefore, the use of Big Data Analytics (BDA) and database encryption in healthcare can be very productive. BDA involve the methods of analyzing the wide amount of electronic data related to patient healthcare and well-being. BDA. It also leads to better diagnosis for personalized healthcare, automated decision algorithms, data transparency, and protecting privacy and so on [47]. In this paper they identified the relationships among big data analytics capabilities, IT-enabled transformation practices and benefits, using the healthcare sector as their case study [48]. Moreover, encryption at the database level provides more flexibility in terms of granularity of encryption. Data can be encrypted at the table level, row level or column level. This type of encryption affects the indexes and need special retrieving queries using indexes that can work with such encrypted data [50]. In the whole security system database encryption is the last line of defense and also is reliable for the information security, but also it is a dynamic safety means that the safety degree can be estimated. So, it is a necessary safety method for information security, also is the final solution [51]. Many recent study has observed that the existing workflow of blood banks needs to be strengthened, both in terms of planning and monitoring. Also, there are many gaps in the management of blood supply. The need for automating blood banks have been there for a long time [52]. The manual system of blood collection and requisitions has long waiting time in queues, which in turn leads to delay in issue of blood. Similarly, maintenance of records during non-peak hours and notifying about blood donation camps to registered donors is a major challenge & time consuming. Keeping everything in mind we came up with the solution of an automated blood bank management system with database encryption.

7. Conclusion

After going through multiple research papers we analyzed that there is no such system through which people can donate their blood and can feel safe with regards to their information which they have provided during any registration. There is no database security provided for donors. So we created a website which involves the login and signup option and people can donate their blood through the same website freely as we have symmetric encryption which secures the database of the individual. Therefore the main aim of our project was to create a website involving the database which is encrypted after insertion of the values thereby protecting one's information.

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