ORGAN DONATION AND TRANSPLANTATION BY USING BLOCKCHAIN MANAGEMENT SYSTEM

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ABSTRACT

Today's organ donation and transplantation systems face numerous challenges related to registration, donor-recipient matching, organ logistics, and ethical considerations. This paper introduces a private Ethereum blockchain-based solution designed to address these challenges, providing a decentralized, secure, traceable, auditable, private, and trustworthy organ donation and transplantation management system. The solution includes the development of smart contracts and the presentation of six algorithms, alongside their implementation, testing, and validation. To assess the performance of this solution, privacy, security, and confidentiality analyses are conducted, and a comparison with existing solutions is provided. The smart contract code is also made publicly available on Getup

1 INTRODUCTION

Organ donation and transplantation represent a critical and life-saving aspect of modern medicine. This medical procedure allows for the replacement of failing or damaged organs with healthy ones, ultimately extending the lives of countless individuals. The significance of organ transplantation is multifaceted and can be summarized as follows:

1.1.1 Significance of Organ Donation and Transplantation

Organ transplantation is often the last resort for individuals suffering from organ failure due to various medical conditions, including heart disease, kidney disease, liver disease, and more. It offers the possibility of renewed life, improved quality of life, and the chance to enjoy precious moments with loved ones that would otherwise be lost.

Literature Survey

Organ Donation and Transplantation

1 Overview of the Organ Donation and Transplantation Process

gan donation and transplantation constitute a complex medical procedure with profound implications for individuals in need of life-saving organ replacements. The process typically involves the following key stages:

Identification of Potential Donors:

Potential organ donors are individuals who have either voluntarily registered as donors or have become candidates posthumously. Deceased donors can provide organs such as the heart, liver, kidneys, lungs, and pancreas, while living donors can provide kidneys, a portion of their liver, or even a lung.

3 IMPLEMENTATION STUDY

EXISTING SYSTEM:

The authors in [17] developed a multi-agent software platform to representthe information workflow model among donor hospitals, regulators, and recipient hospitals. This platform optimizes the pre-transplantation tasks, which can improve the process efficiency. In addition, it allows storing potential donor information and improves direct communication among all participants in the organ transplantation process. An information workflow was simulated using the developed platform, and it was estimated that the saved time might be between three to five hours.

Disadvantages:

- The system is not implemented block chain based organ donation which leads less security and less communication between hospitals and donors.
- The system is not implemented an auto-matching process between the donor and recipient through a smart contract based on certain criteria.

Proposed System & alogirtham

The system proposes a private Ethereum block chain-based solution that ensures organ donation and transplantation management in a manner that is decentralized, secure, reliable, traceable, auditable, and trustworthy.The system develops smart contracts that register actors and ensure data provenance through producing events for all the necessary actions that occur during the organ donation and transplantation stages.

4.1 Advantages:

- The system is implemented an organ donation based on blockchain techniques which is more fast and secure.
- In the proposed system, the system is implemented an automatic process of human organ donation.

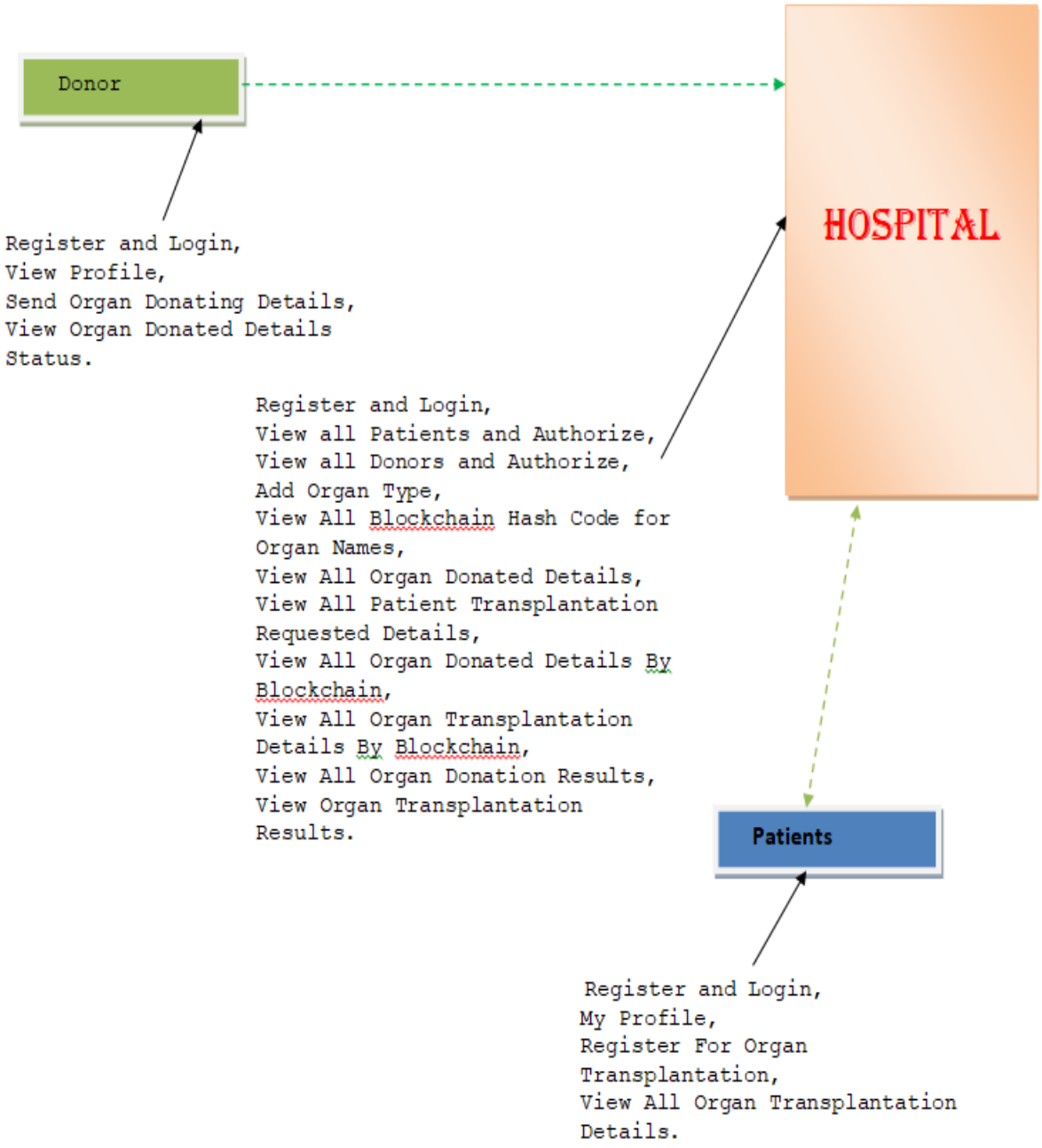


Fig:3.1 System Architecture

IMPLEMENTATION

Implementation Details

The successful implementation of the proposed blockchain-based organ donation and transplantation system involves various technical aspects and considerations. Below, we discuss the key technical elements and implementation details of the system:

Smart Contract Development:

Smart contract development is a fundamental step in the implementation process. Smart contracts are created using Ethereum's Solidity programming language, and they define the rules and logic governing various aspects of the system, such as donor-recipient matching, consent verification, organ allocation, and logistics management.

Development Tools:

Industry-standard development tools and integrated development environments (IDEs) for Ethereum, such as Truffle and Remix, are used to write, test, and deploy smart contracts efficiently.

5 RESULTS AND DISCUSSION

1 HOME PAGE

FIG:5.1 HOME PAGE

5.3.2 HOSPITAL MENU PAGE

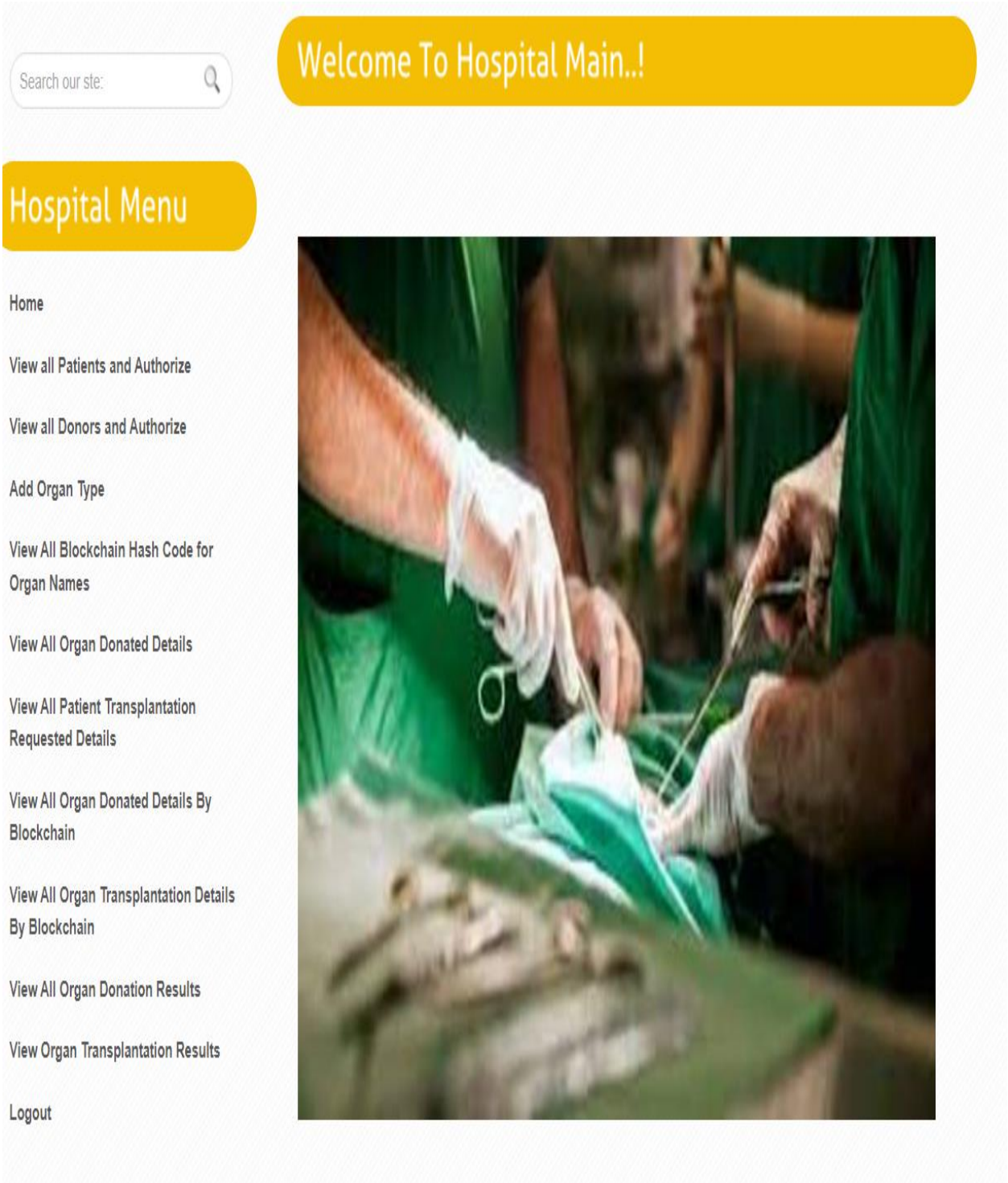
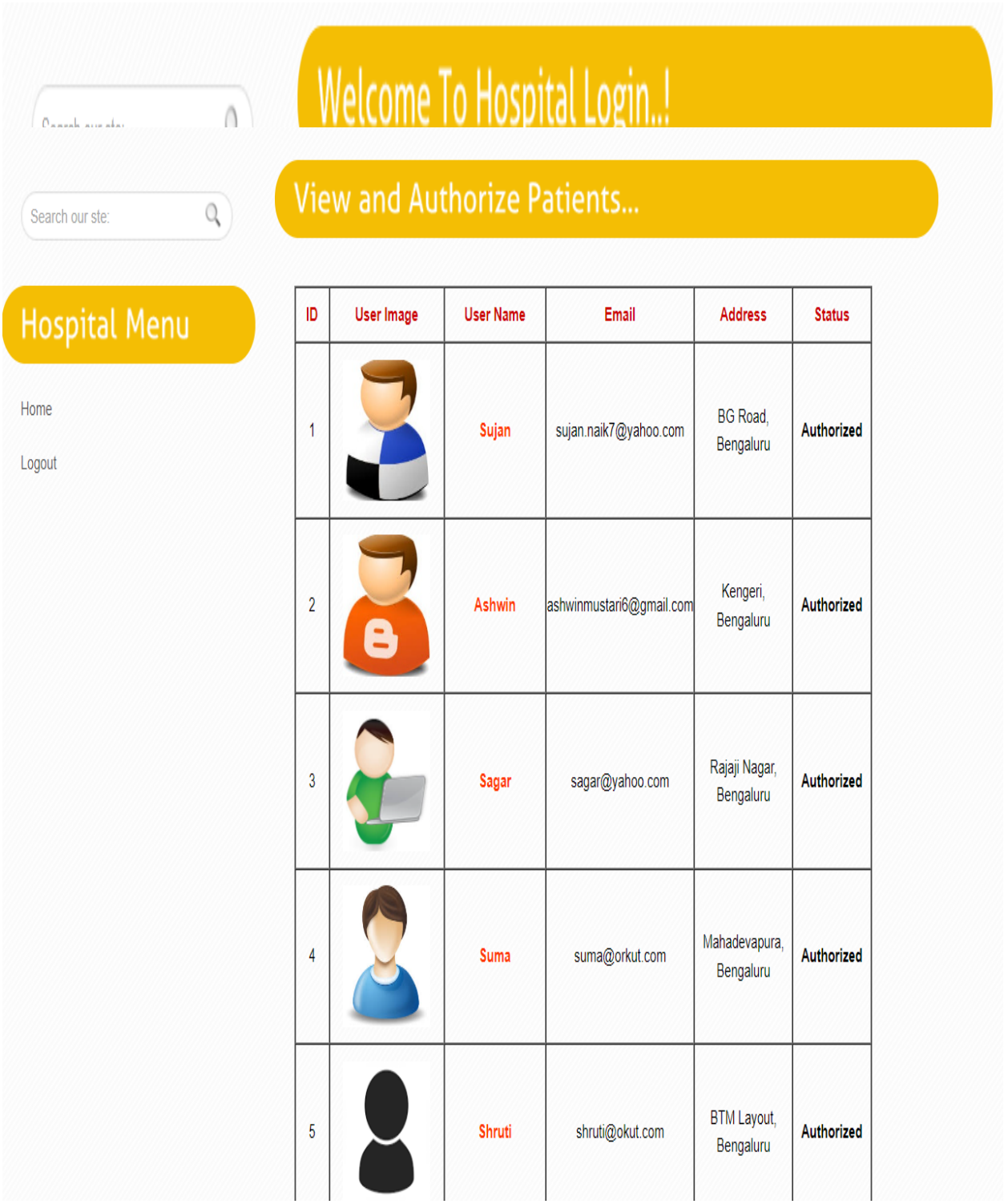


FIG:5.2 HOSPITAL MENU PAGE

5.3.3 LOGIN PAGE

FIG:5.3 LOGINPAGE



ID	User Image	User Name	Email	Address	Status
1		Sujan	sujan.naik7@yahoo.com	BG Road, Bengaluru	Authorized
2		Ashwin	ashwinmustari6@gmail.com	Kengeri, Bengaluru	Authorized
3		Sagar	sagar@yahoo.com	Rajaji Nagar, Bengaluru	Authorized
4		Suma	suma@orkut.com	Mahadevapura, Bengaluru	Authorized
5		Shruti	shruti@okut.com	BTM Layout, Bengaluru	Authorized

5.3.4 VIEW AND AUTHORIZE PATIENTS

FIG:5. 4 :VIEW AND AUTHORIZE PATIENTS

5.3.5 VIEW BLOCKCHAIN HASHCODE FOR ORGAN NAME

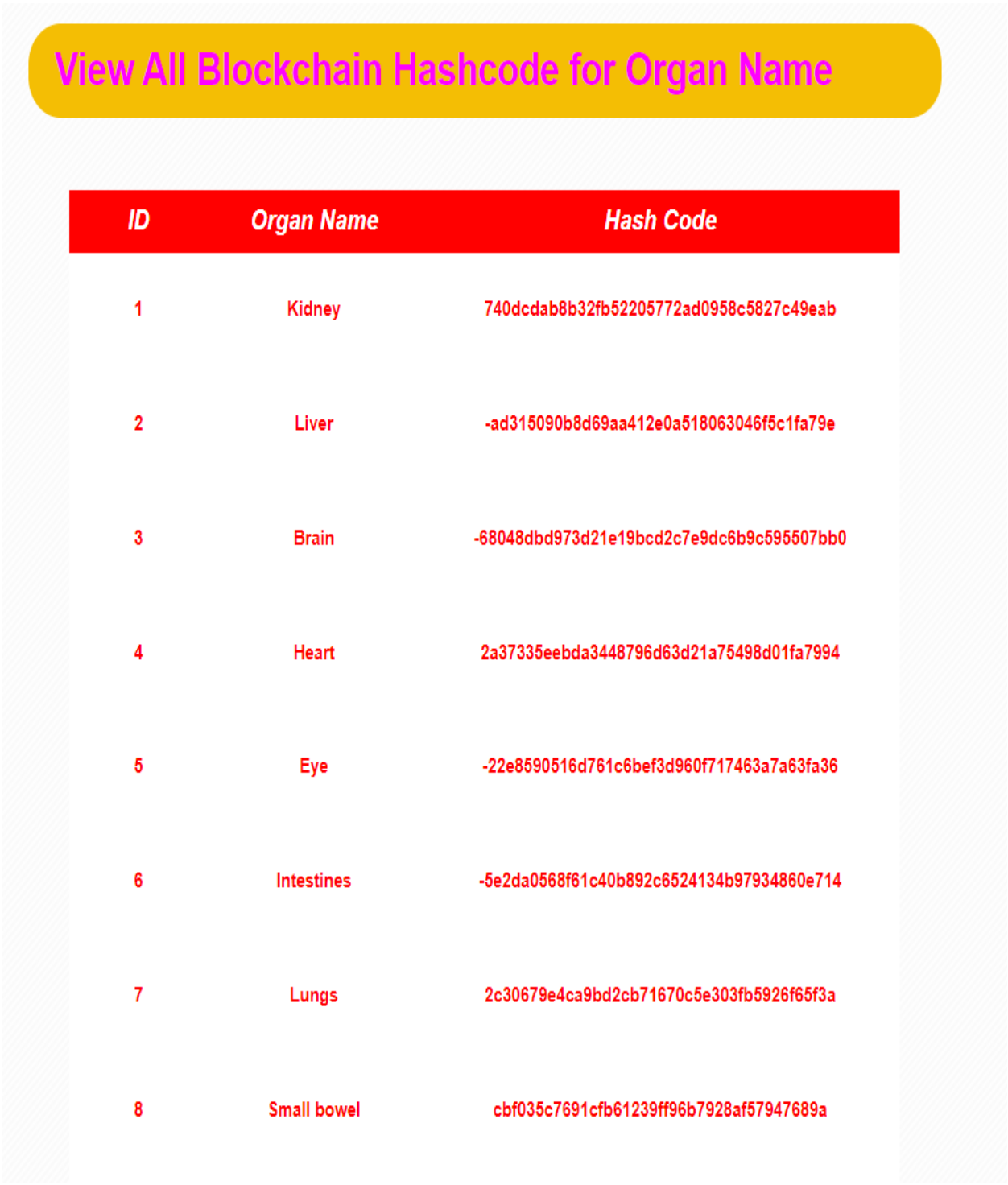
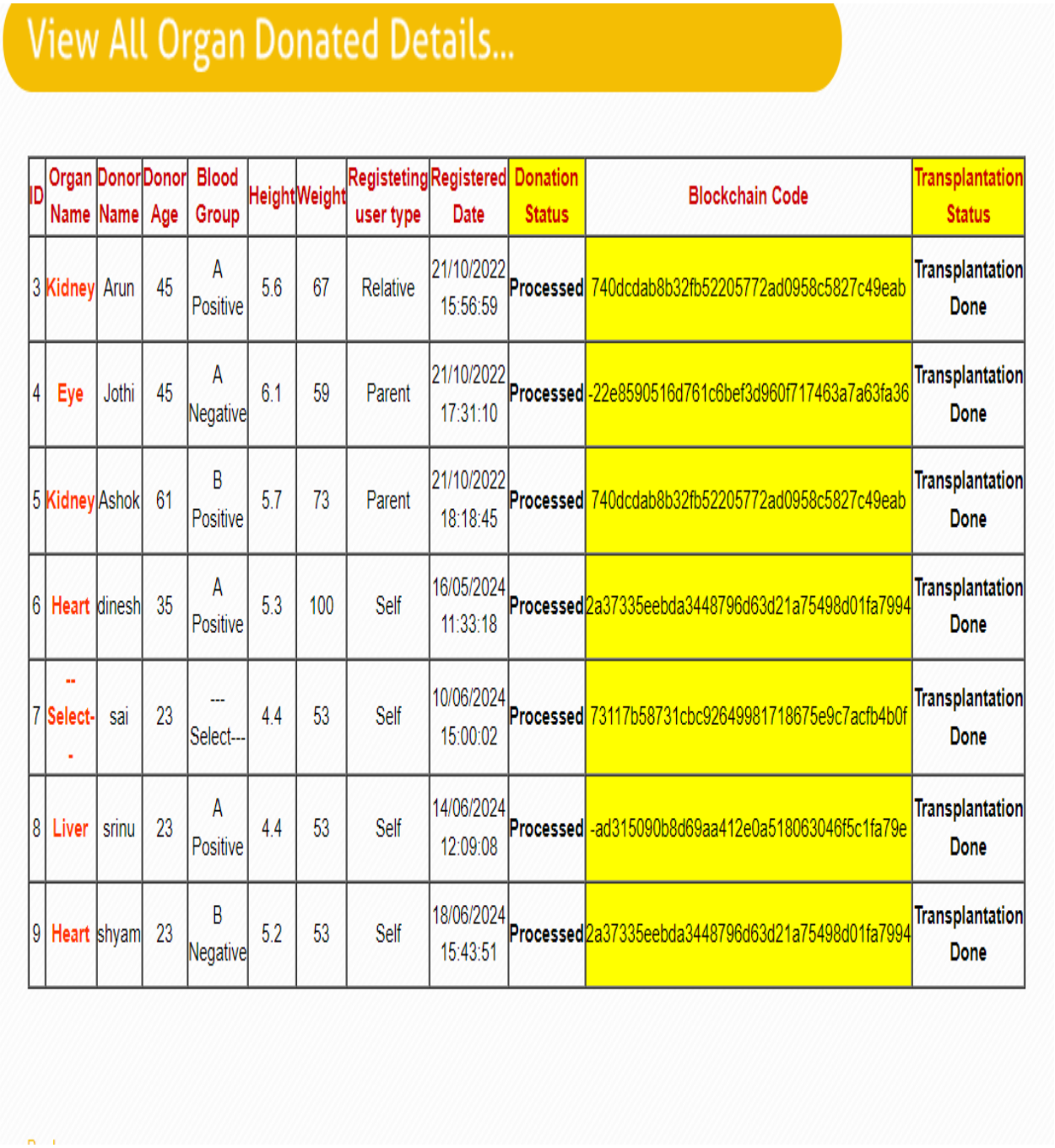


FIG:5.5: VIEW BLOCKCHAIN HASHCODE FOR ORGAN NAME

5.3.6 VIEW ALL ORGAN DONATED DETAILS

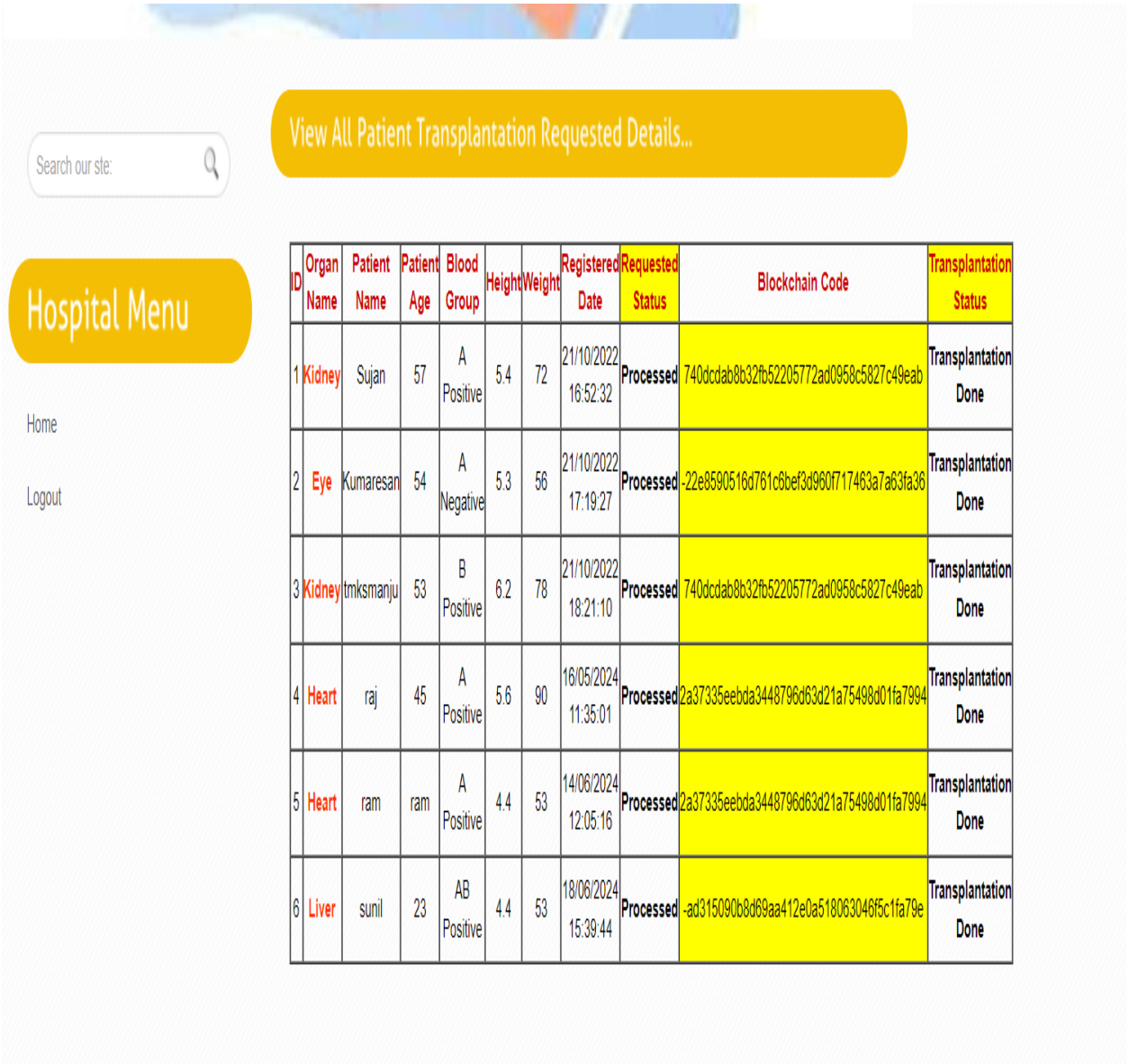


ID	Organ Name	Donor Name	Donor Age	Blood Group	Height	Weight	Registeting user type	Registered Date	Donation Status	Blockchain Code	Transplantation Status
3	Kidney	Arun	45	A Positive	5.6	67	Relative	21/10/2022 15:56:59	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done
4	Eye	Jothi	45	A Negative	6.1	59	Parent	21/10/2022 17:31:10	Processed	-22e8590516d761c6bef3d960f717463a7a63fa36	Transplantation Done
5	Kidney	Ashok	61	B Positive	5.7	73	Parent	21/10/2022 18:18:45	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done
6	Heart	dinesh	35	A Positive	5.3	100	Self	16/05/2024 11:33:18	Processed	2a37335eebda3448796d63d21a75498d01fa7994	Transplantation Done
7	--Select--	sai	23	---Select---	4.4	53	Self	10/06/2024 15:00:02	Processed	73117b58731cbc92649981718675e9c7acfb4b0f	Transplantation Done
8	Liver	srinu	23	A Positive	4.4	53	Self	14/06/2024 12:09:08	Processed	-ad315090b8d69aa412e0a518063046f5c1fa79e	Transplantation Done
9	Heart	shyam	23	B Negative	5.2	53	Self	18/06/2024 15:43:51	Processed	2a37335eebda3448796d63d21a75498d01fa7994	Transplantation Done

FIG:5.6 : VIEW ALL ORGAN DONATED DETAILS

5.3.7 VIEW ALL PATIENTS TRANSPLANTATION REQUESTED DETAILS

FIG:5.7: VIEW ALL PATIENTS TRANSPLANTATION REQUESTED DETAILS



ID	Organ Name	Patient Name	Patient Age	Blood Group	Height	Weight	Registered Date	Requested Status	Blockchain Code	Transplantation Status
1	Kidney	Sujan	57	A Positive	5.4	72	21/10/2022 16:52:32	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done
2	Eye	Kumaresan	54	A Negative	5.3	56	21/10/2022 17:19:27	Processed	-22e8590516d761c6bef3d960f717463a7a63fa36	Transplantation Done
3	Kidney	tmksmanju	53	B Positive	6.2	78	21/10/2022 18:21:10	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done
4	Heart	raj	45	A Positive	5.6	90	16/05/2024 11:35:01	Processed	2a37335eebda3448796d63d21a75498d01fa7994	Transplantation Done
5	Heart	ram	ram	A Positive	4.4	53	14/06/2024 12:05:16	Processed	2a37335eebda3448796d63d21a75498d01fa7994	Transplantation Done
6	Liver	sunil	23	AB Positive	4.4	53	18/06/2024 15:39:44	Processed	-ad315090b8d69aa412e0a51806306f5c1fa79e	Transplantation Done

5.3.8 VIEW ALL ORGAN DONATED DETAILS BY BLOCK CHAIN

ID	Organ Name	Donor Name	Donor Age	Blood Group	Height	Weight	Registeting user type	Registered Date	Donation Status	Blockchain Code	Transplantation Status
3	Kidney	Arun	45	A Positive	5.6	67	Relative	21/10/2022 15:56:59	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done
5	Kidney	Ashok	61	B Positive	5.7	73	Parent	21/10/2022 18:18:45	Processed	740dcdab8b32fb52205772ad0958c5827c49eab	Transplantation Done

ID	Organ Name	Donor Name	Donor Age	Blood Group	Height	Weight	Registeting user type	Registered Date	Donation Status	Blockchain Code	Transplantation Status
8	Liver	srinu	23	A Positive	4.4	53	Self	14/06/2024 12:09:08	Processed	-ad315090b8d69aa412e0a518063046f5c1fa79e	Transplantation Done

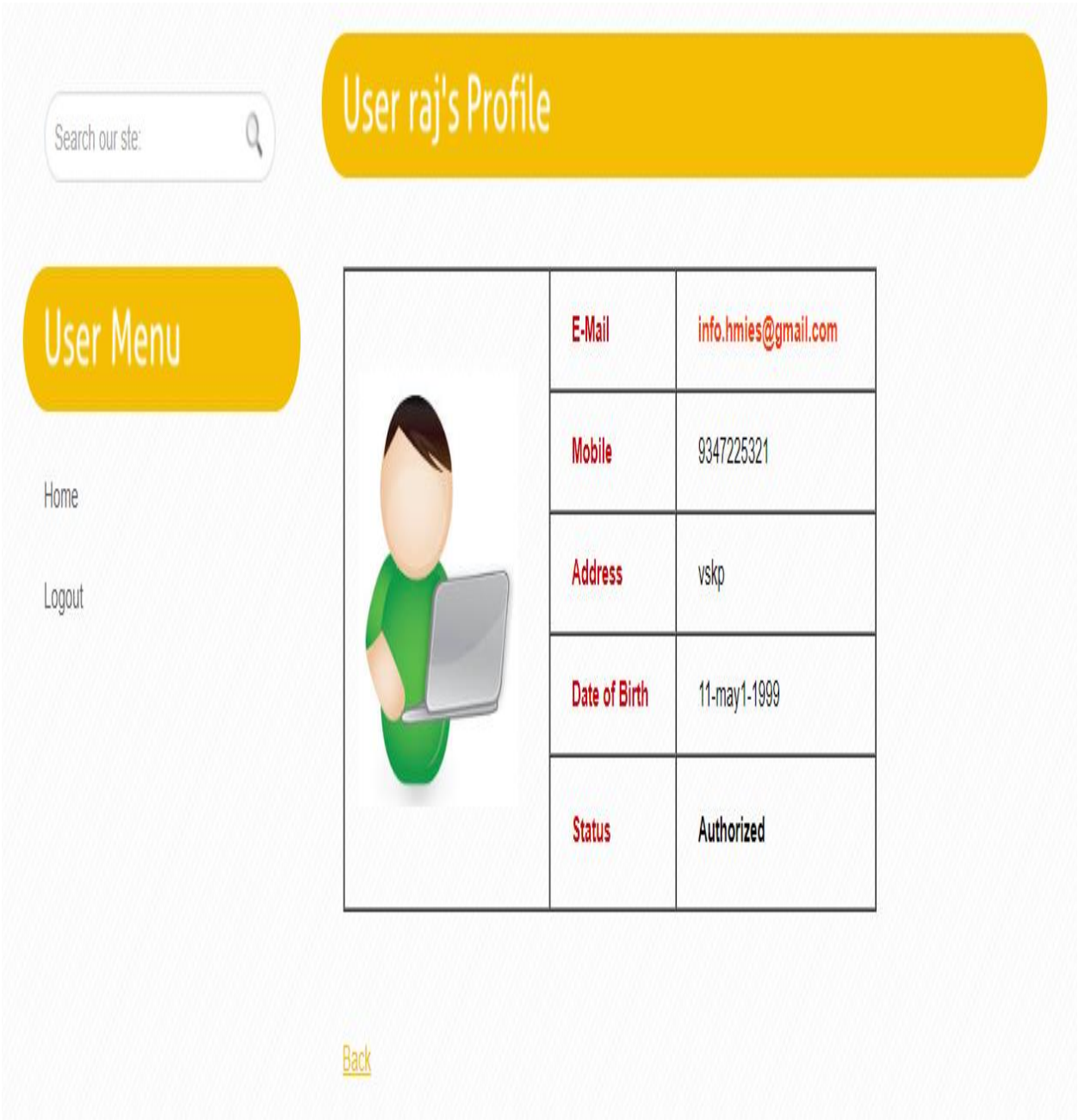
FIG:5.8 VIEW ALL ORGAN DONATED DETAILS BY BLOCK CHAIN

5.3.9 INVALID LOGIN DETAILS,PLEASE TRY AGAIN

FIG:5.9 INVALID LOGIN DETAILS,PLEASE TRY AGAIN

5.3.10 USERS PROFILE

FIG:5.10 USERS PROFILE



5.3.11 VIEW ALL ORGAN TRANSPLANTATION DETAILS

FIG:5.11 VIEW ALL ORGAN TRANSPLANTATION DETAILS

5.3.12 VIEW ORGAN TRANSPLANTION RESULTS

FIG 5.12 VIEW ORGAN TRANSPLANTION RESULTS

6. CONCLUSION AND FUTURE WORK

CONCLUSION

Summary of Findings

The research conducted in this study has resulted in several key findings:

Efficiency:

The proposed block chain-based organ donation and transplantation system significantly enhances the efficiency of the organ allocation process. Smart contracts and algorithms automate donor-recipient matching, reducing waiting times and streamlining organ transportation logistics.

Transparency:

Block chain technology brings a new level of transparency to organ transplantation management. Patients, donors, and healthcare providers can track the status of organ allocation and transportation in real-time, fostering trust and accountability.

7. REFRENCES

[1] L. A. Dajim, S. A. Al-Farras, B. S. Al-Shahrani, A. A. Al-Zuraib, and R. Merlin Mathew, ``Organ donation decentralized application using block chain technology," in Proc. 2nd Int. Conf. Compute. Appl. Inf. Secure. (ICCAIS), May 2019, pp. 14, doi: 10.1109/cais.2019.8769459.

[2] A. Powell. (Mar. 18, 2019). A Transplant Makes History. Harvard Gazette. [Online]. Available: https://news.harvard.edu/gazette/story/2011/09/atransplant- makes-history/

[3] Organ Donation Facts and Info: Organ Transplants. Accessed: Apr. 18, 2021. [Online]. Available: https://my.clevelandclinic.org/health/ articles/11750-organ-donation-and-transplantation

[4] (Mar. 21, 2019). Facts and Myths About Transplant. Accessed: Apr. 21, 2021. [Online]. Available: https://www.americantransplant foundation.org/about-transplant/facts-and-myths/

[5] Organ Procurement and Transplantation Network. Accessed: Apr. 18, 2021. [Online]. Available: https://optn.transplant.hrsa.gov/ resources/ethics/ethical-principles-in-the-allocation-of-humanorgans/

[6] How Donation Works. Accessed: Jan. 7, 2022. [Online]. Available: https://www.organdonor.gov/learn/process

[7] UFO Themes. (Aug. 1, 2017). Organ Donation and Transplantation in Germany.Plastic Surgery Key. [Online]. Available: https:// plasticsurgerykey.com/organ-donation-and-transplantation-in-germany/

[8] Harvard Business Review. (Dec. 13, 2021). Electronic Health Records Can Improve the Organ Donation Process. Accessed: Apr. 8, 2022. [Online]. Available: https://hbr.org/2021/12/electronic-health-records-can-improvethe- organ-donation-process