HBRP PUBLICATION

Recent Trends in Androids and IOS Applications
Volume 7 Issue 2, May-Aug 2025
e-ISSN: 3048-9733
DOI: https://doi.org/10.5281/zenodo.15550768

HealthQ: A Hassle-Free Solution for Hospital Appointment Booking

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ABSTRACT

In today's fast-paced world, efficient healthcare services are essential for maintaining the well-being of individuals. This abstract outline a Doctor Appointment Booking System aimed at simplifying the process of arranging medical appointments. By harnessing technological advancements, the system seeks to optimize healthcare accessibility, minimize patient wait times, and improve the overall experience for patients. The proposed project is smart online appointment booking system that provides patients or any user and easy way of booking a doctor's appointment online. This is a web-based application that overcomes the issue of managing and booking appointments according to user's choice or demands. The task sometime becomes very tedious for the compounder or doctor himself in manually allotting appointments for the users as per their availability. Hence this project offers an effective solution where user can view various booking slots available select the preferred date and time. The already booked space will be marked grey and will not be available for anyone else for the specified time. This system also allows users to cancel their booking anytime. The system also provides a basic biodata about the doctor and user experience with the doctor. It also includes a built-in notification system to deliver appointment reminders, helping to lower no-show rates and maximize resource efficiency The application uses HTML, CSS and JavaScript as a frontend and SQL database as the back end, along with Flask. These features collectively improve healthcare services and promote patient well-being, making it an indispensable tool in the healthcare sector.

Keywords: *Healthcare, real-time, optimize, appointment booking, doctor*

1. INTRODUCTION

The Internet holds immense potential to enhance patient access to health information and integrate patient and health information management into a unified, adaptable system. This system consists of two modules: one designed for patients, featuring a login interface, and another for practitioners, offering online appointment booking and scheduling tools. It brings numerous advantages, such as engaging patients, creating a welcoming experience, and securely storing patient details for future reference. The Doctor Appointment System is a modern, web-based platform that simplifies the process of booking medical appointments. In the realm of healthcare, this project aims to offer a more convenient and user-friendly way for patients to connect with their healthcare providers. Traditional methods

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of scheduling doctor appointments often involve tedious phone calls, prolonged waiting times, and potential errors. This system addresses these challenges, making healthcare more accessible and patient-focused. The system comes equipped with features that benefit both patients and practitioners. Users can create accounts, search for doctors based on specific criteria, and schedule appointments that align with their availability. It also includes tools for secure, real-time communication between patients and doctors, ensuring the safe exchange of critical medical information. Beyond simplifying the appointment process, the system fosters transparency and accountability. Patients can provide reviews and feedback about their experiences with doctors, helping others make informed choices and offering practitioners valuable insights to enhance their services. The Doctor Appointment System goes beyond just managing appointments; it is a comprehensive healthcare solution. It paves the way for future advancements, such as remote health monitoring devices, 24/7 support from intelligent chatbots, and seamless access to healthcare services through mobile applications. As technology continues to transform healthcare, this system stands at the forefront of innovation. It highlights how technology can strengthen patient-doctor relationships, improve personalized care, and usher in a new era of data-driven healthcare management. This introduction merely scratches the surface of the system's significance and potential to revolutionize healthcare for everyone.

2. LITERATURE SURVEY

"ONLINE DOCTOR APPOINTMENT SYSTEM**"** work done by Jaydeep C. Suryawanshi, Mohnish K. Patil, Rushikesh C. Waghmare, and Prof. Pooja Patil presents a web-based online doctor appointment system aimed at streamlining the interaction between patients and healthcare providers. The platform allows patients to register, browse doctors by specialization, check real-time availability, and book appointments efficiently. Doctors have access to patient history during consultations, helping them make better decisions. The system also includes admin functionality to manage users and records. The authors emphasize minimizing hospital queues, improving scheduling accuracy, and digitizing health services for better access and management **[1].**

"DOCTOR APPOINTMENT BOOKING SYSTEM" by Dr. R. P. S. Manikandan, Aswin G, Chandru A, and Murali Prasad M presents a modern web-based platform to improve healthcare accessibility through digital appointment scheduling. This system enables patients to browse doctor profiles, select suitable time slots, and communicate securely with healthcare providers. Key features include user registration, real-time schedule management, secure messaging, and automated appointment notifications. The system also facilitates transparency through patient feedback and data analytics for healthcare optimization. Designed to reduce waiting times and streamline doctor-patient interaction, the platform marks a significant advancement in patient-centred healthcare delivery and service efficiency **[2].**

"HEALTH CARE APPLICATION – A DOCTOR APPOINTMENT SYSTEM" by Atharva S. Wankhade and colleagues focuses on an Android mobile app that offers smart features like symptom analysis, health monitoring, chat consultation, and e-wallet payments. It integrates AI and user-specific modules to streamline the medical booking and consultation process, promoting a user-centric approach in digital healthcare delivery **[3].**

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"A DOCTOR APPOINTMENT BOOKING SYSTEM" by D. Bharadwaja, Ch. Bhavya Sri, and others presents a web-based interface that automates the manual process of booking medical consultations. The system allows both doctors and patients to register, login, and manage appointments. It ensures secure access through unique credentials and provides real-time updates regarding availability and cancellations. The platform simplifies hospital visits by offering an organized appointment system that enhances user convenience and reduces administrative burdens **[4].**

"A WEB BASED ONLINE DOCTOR'S APPOINTMENT AND MEDICAL DATABASE MANAGEMENT SYSTEM" by Akingbade Osasere Luisa and Onwuasoanya Nzube Chibuoyi explores a centralized online system for handling doctor-patient interactions, appointment bookings, and electronic health records. The system uses a three-tier architecture, enabling patients to register, choose doctors based on location and ailment, and receive appointment confirmations through the admin interface. It significantly reduces queue times and enhances record accuracy **[5].**

"HOSPITAL APPOINTMENT SYSTEM" by Aishwarya Rajendra Swami, Siddika Mushtaq Shaikh, and Sonal Ramchandra Shinde presents an IOT-based system for managing patient appointments and storing records digitally. The system includes RFID-enabled patient identification and integrates both hardware and software modules for seamless appointment scheduling. It addresses challenges of traditional hospital management through automation and online accessibility **[6].**

"ONLINE DOCTOR APPOINTMENT SYSTEM" by Venkatesh Rallapalli et al. emphasizes web-based automation for doctor scheduling and appointment booking. This system allows doctors to register and manage schedules while patients can view doctor availability and receive prescriptions digitally. The main goal is to minimize delays and improve healthcare efficiency, particularly in pandemic-affected areas **[7].**

"ONLINE DOCTOR'S APPOINTMENT SYSTEM" by Swapnil Nyayade, Kartik Pawar, Nayan Sonawane, and Aniket Patil proposes a smart digital platform that enables users to book medical consultations conveniently via the internet. The system provides key features like real-time doctor availability, patient registration, booking and cancelling appointments, and maintaining medical history. It facilitates two-way interaction between patients and doctors, improving the overall healthcare experience and reducing waiting time in hospitals. Doctors can view patient history during consultations, while patients can manage appointments from home **[8].**

"ONLINE DOCTOR APPOINTMENT SYSTEM" by R. Karthikeyan, N. Keerthivasan, R. Gowtham, and D. Vignesh proposes a robust doctor appointment system that automates and simplifies the patient booking process. It includes modules for patient registration, doctor selection by department
or specialization, time slot allocation, and admin controls. The system is designed to reduce manual errors and long waiting hours while increasing efficiency in patient-doctor interactions. The authors also highlight the potential integration of future enhancements like teleconsultation and e-prescriptions to further streamline healthcare services **[9].**

"DOCTOR APPOINTMENT ONLINE BOOKING SYSTEM" by Ms. Sanjeevani P. Avhale, Ms. Wrushali R. Ajabe, and team introduces an Android-based application that automates appointment

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scheduling and includes features like patient-doctor interaction, appointment tracking, and notification alerts. The application provides monthly earnings tracking for doctors and ensures that only available time slots can be booked. It leverages a secure login system and ensures appointment confirmation via the app **[10].**

3. DESIGN METHODOLOGY

The design as shown in figure 1 of a project lays out the blueprint for how it will function. It details the steps, materials, and tools needed to achieve the project's goals. It is like a recipe ensuring everyone understands how to turn the idea into reality. HealthQ is designed to provide a seamless and intuitive experience for users across for booking hospital appointment, across different departments.

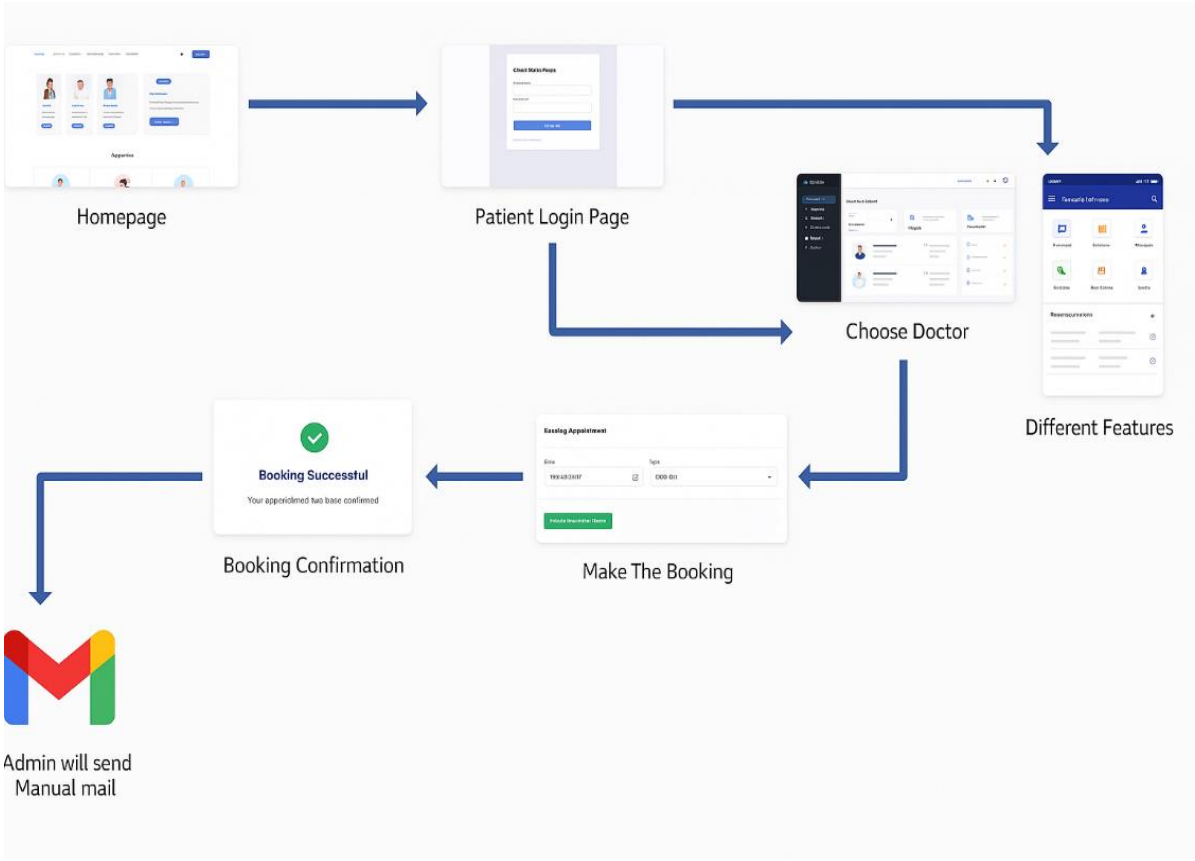

Fig. 1: *Block Diagram of HealthQ.*

Block Diagram

- The above block diagram represents the structure for the HealthQ website with available features. It shows the outline for the procedure.

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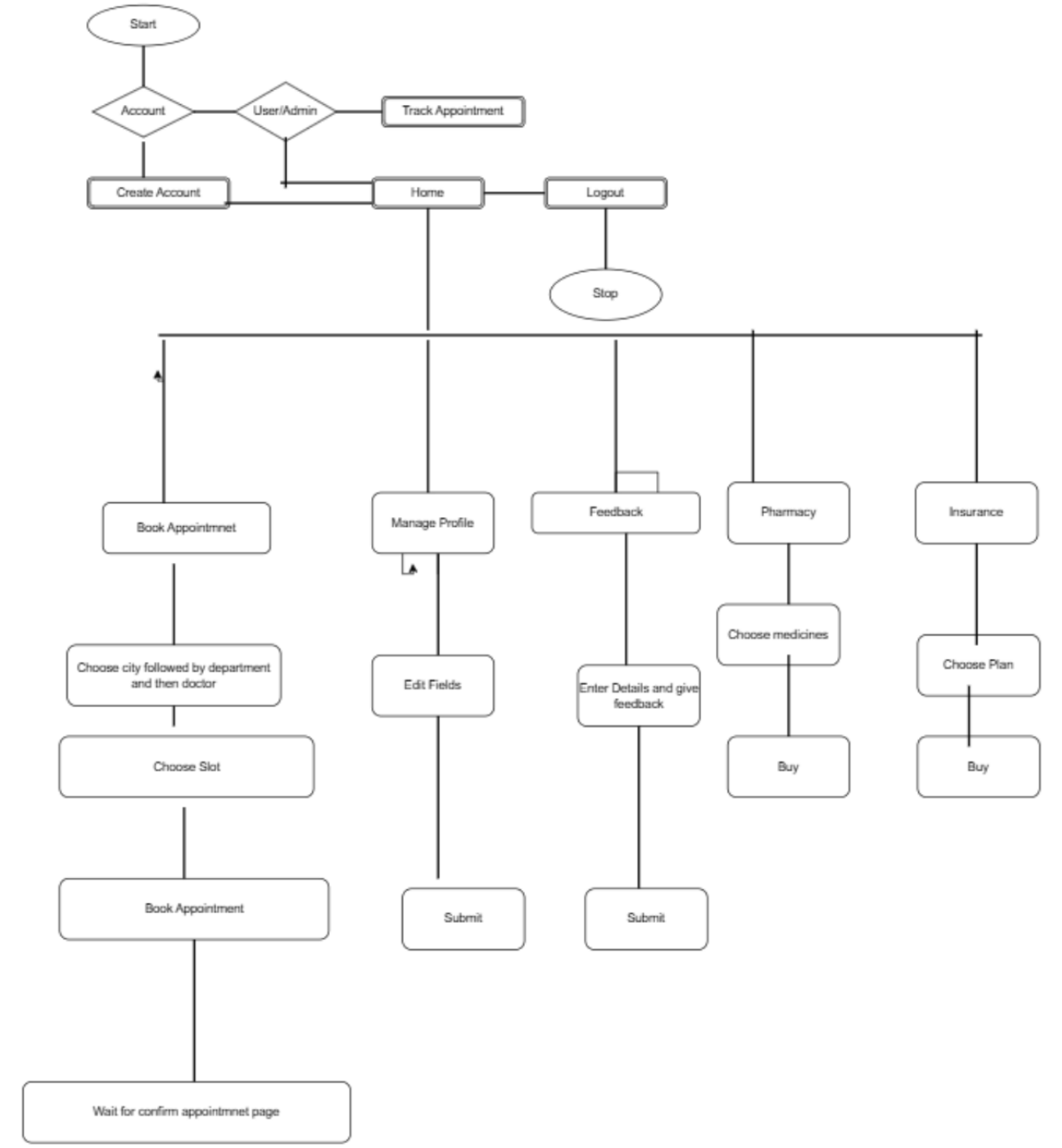

Fig. 2: *Flow Diagram of HealthQ.*

Flowchart

The above flowchart in the figure 2 represents the process of what happens in the HealthQ website. In the there is a homepage from where the patient can create account the login. If the patient is an already user, they can login and move to welcome page from where features are accessible. The admin can login to track the appointments.

System Architecture

The HealthQ application followed a client-server architecture, where the frontend components (HTML, CSS, and JavaScript)

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interacted with the backend server (Flask) through HTTP requests and WebSocket connections. SLQlite3 was the intermediary for data storage and synchronization between clients and the server.

The application, developed using VS Code, requires a modern operating system and web browser. Users can access the website across devices with an internet connection. Adequate storage and a minimum of 2GB RAM are recommended for optimal performance. The website runs on latest version of most browsers.

4. IMPLEMENTATION

The hospital appointment booking system was implemented as a web-based platform using a combination of HTML, CSS (Bootstrap), JavaScript for the frontend, Flask (Python) for the backend, and SQLite as the database. The system follows a modular architecture as shown in the flowchart, which helps in clear navigation and efficient management of different functionalities.

User and Admin Account Creation

- Users and admins can create accounts by providing necessary details such as name, email, password, etc.
- Backend handles form validation and stores user credentials securely in the SQLite database using hashed passwords.

Login and Home Page

- Users and admins can log in with valid credentials.
- After authentication, users are redirected to the **Home** page where they can:
  - Book Appointments
  - Manage Profile
  - Track Appointments
  - Give Feedback
  - Access Pharmacy and Insurance modules

Book Appointment

- Users can book appointments by:
  - Choosing a city
  - Selecting a department
  - Choosing a doctor from the selected department
  - Selecting an available slot
- Once a slot is selected, the appointment is confirmed and saved in the database.
- A confirmation page is displayed with appointment details.

Manage Profile

- Users can update their personal information using the **Manage Profile** feature.
- Editable fields include: name, age, blood group, date of birth, medical history, email, and password.
- Changes are submitted and updated in the database.

Track Appointment

- Users can view a list of all their booked appointments.
- The backend retrieves appointment data specific to the logged-in user and displays it in a tabular format.

Feedback Module

- Users can provide feedback through a form.
- Feedback is stored in the database for administrative review.

Pharmacy Module

- Users can browse a list of medicines.
- Selected medicines can be added to the cart and "purchased" (simulated functionality).
- Purchases are recorded in the database.

Insurance Module

- Users can view and select from available insurance plans.
- Selected plans are saved under the user’s profile.

Logout and Session Management

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- Users can securely log out, which ends the session.
- Session cookies are used to maintain user state while logged in.

Technology Stack

- **Frontend**: HTML5, CSS3, Bootstrap, JavaScript
- **Backend**: Flask (Python)
- **Database**: SQLite
- **Authentication**: Flask-Login and password hashing

Testing

Testing and validating the HealthQ website is critical to ensure its robustness, performance, and user satisfaction. This section details the test cases, scenarios, performance metrics, and user feedback gathered during the beta testing phase. Testing covered the application's functionality, performance, security, and usability aspects.

5. RESULTS

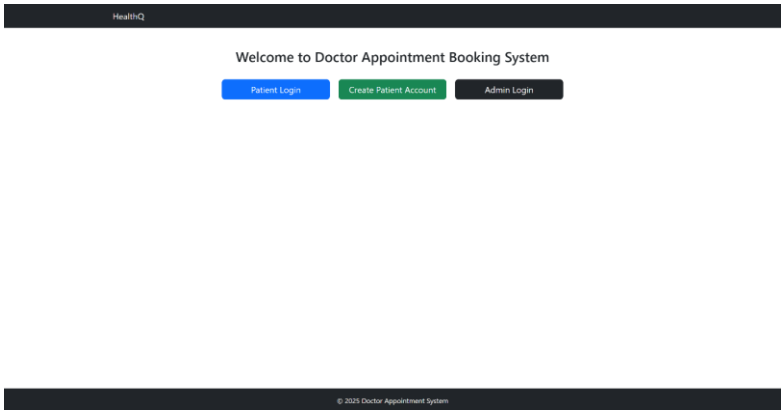

Fig. 3: *Welcome Page of HealthQ.*

Welcome Page

It is a Welcome page where all features are available. (Figure 3)

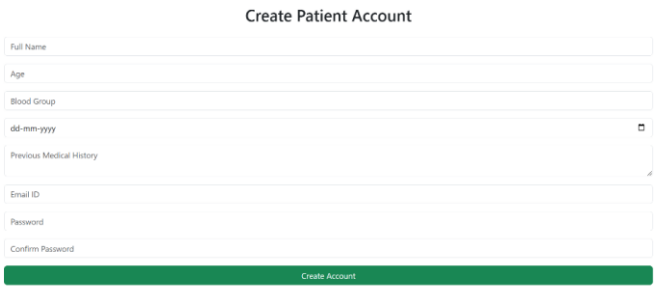

Fig. 4: *Create Account Page.*

New Account

If account is not present a new account can be created. (Figure 4)

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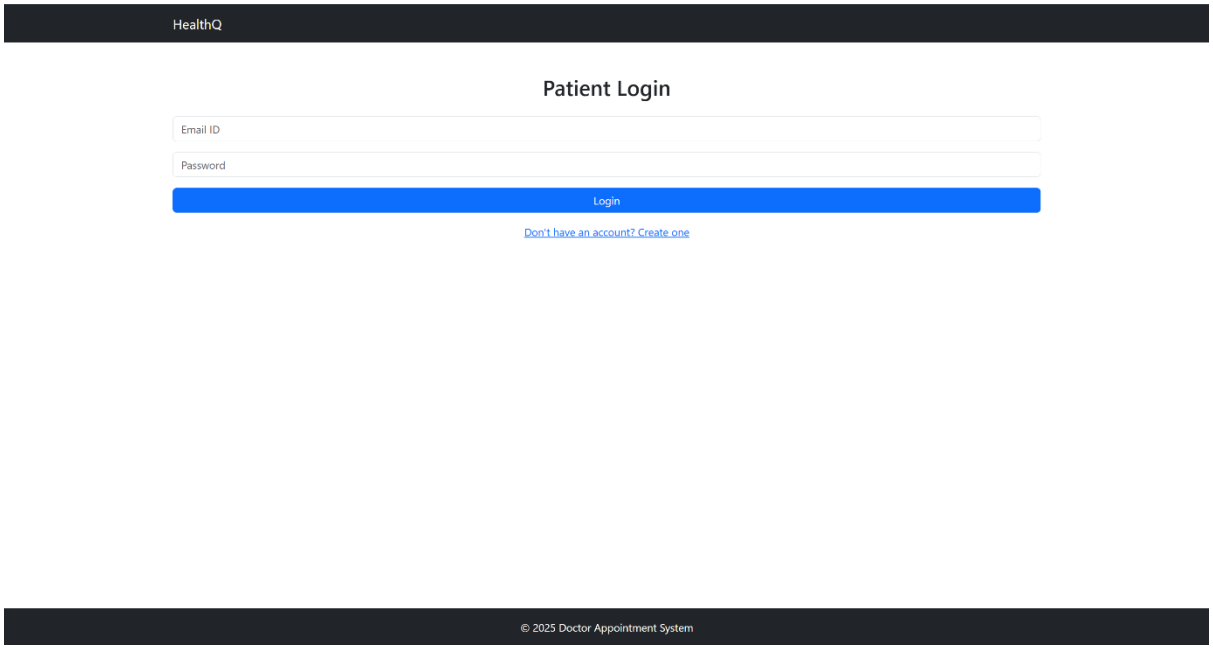

Fig. 5: *Patient Login.*

User Authentication
Verify that you have logged in with valid credentials. (Figure 5)

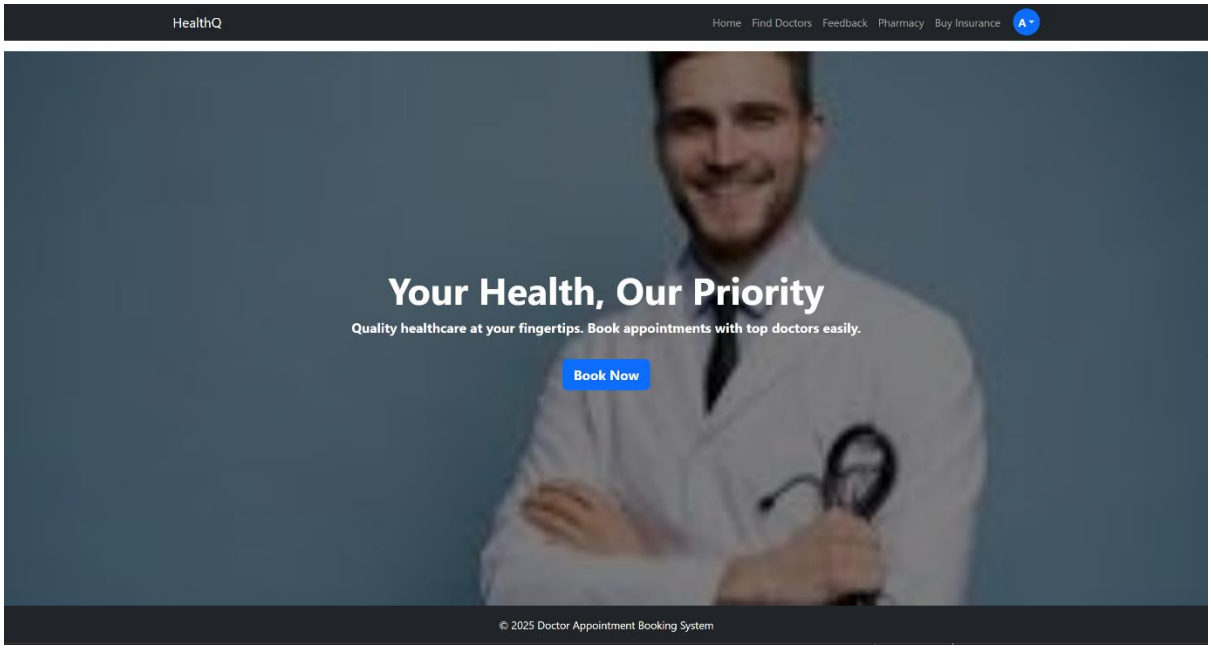

Fig. 6: *Homepage Of HealthQ.*

Homepage
An interface where all features are accessible (figure 6)

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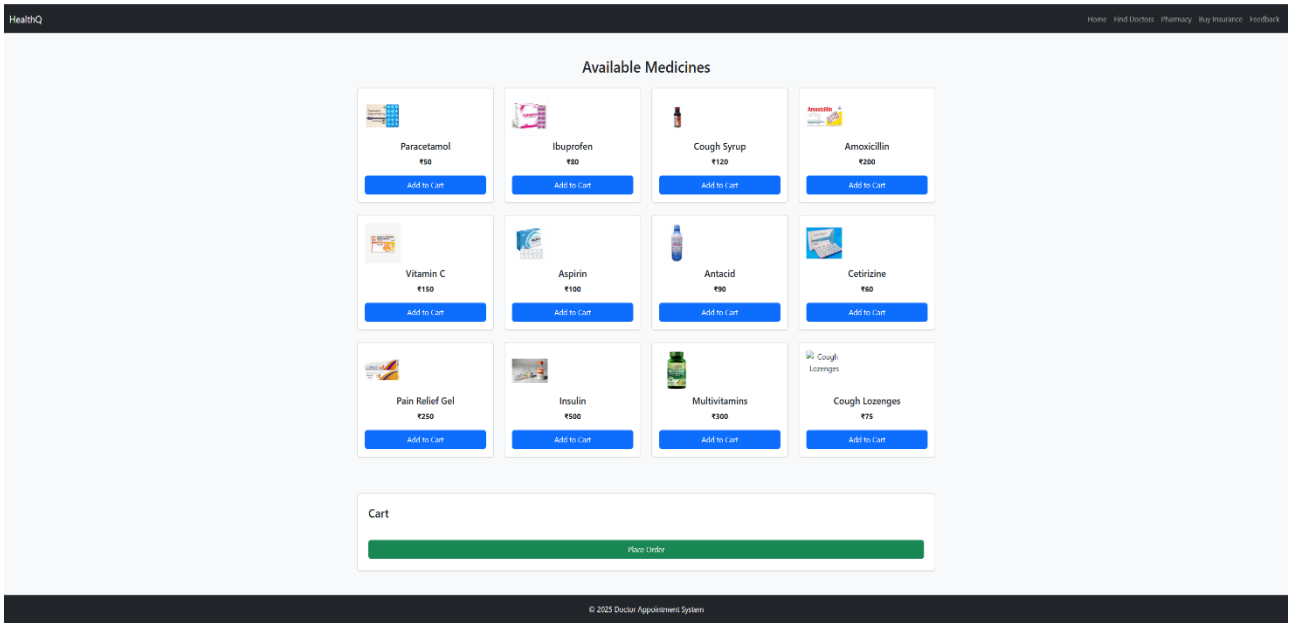

Fig. 7: *Pharmacy.*

Pharmacy
Webpages where available products and their prices are available (figure 7)

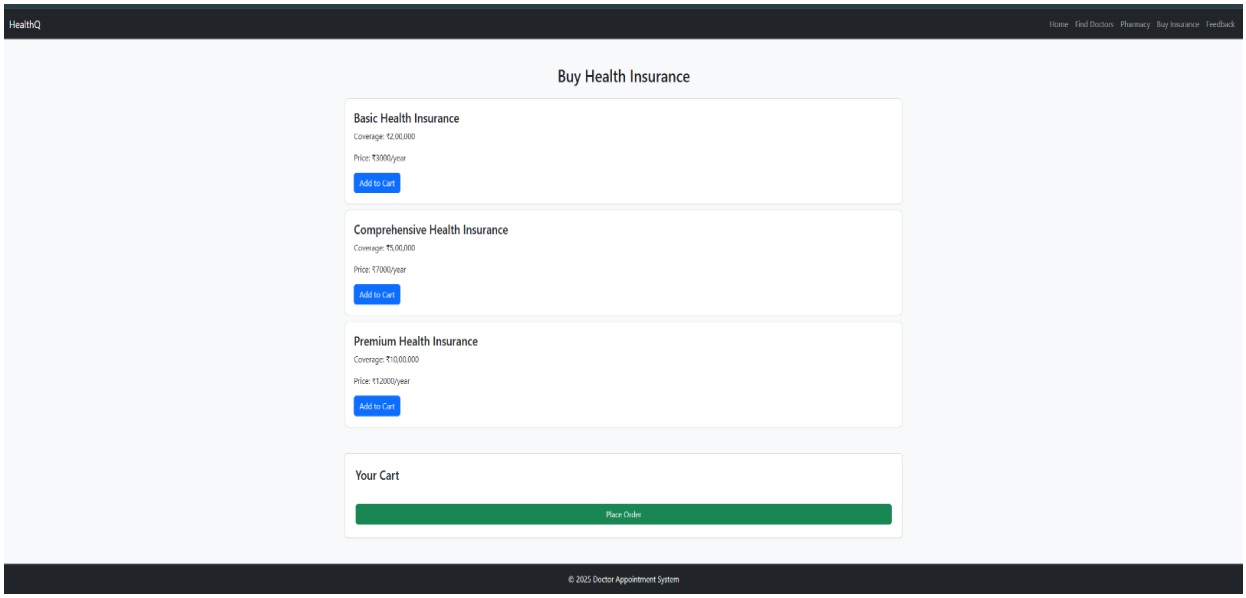

Fig. 8: *Buy Insurance.*

Insurance
Webpages where available policies and their prices are available (figure 8)

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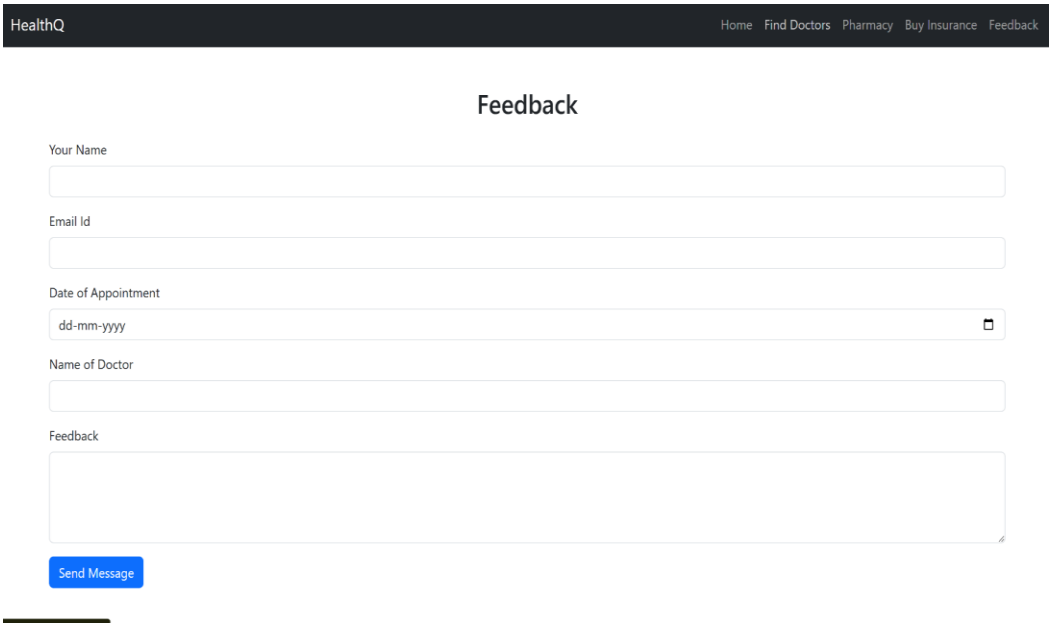

Fig. 9: *Feedback Form.*

Feedback

A Feedback form is provided to understand the patient's experience (figure 9)

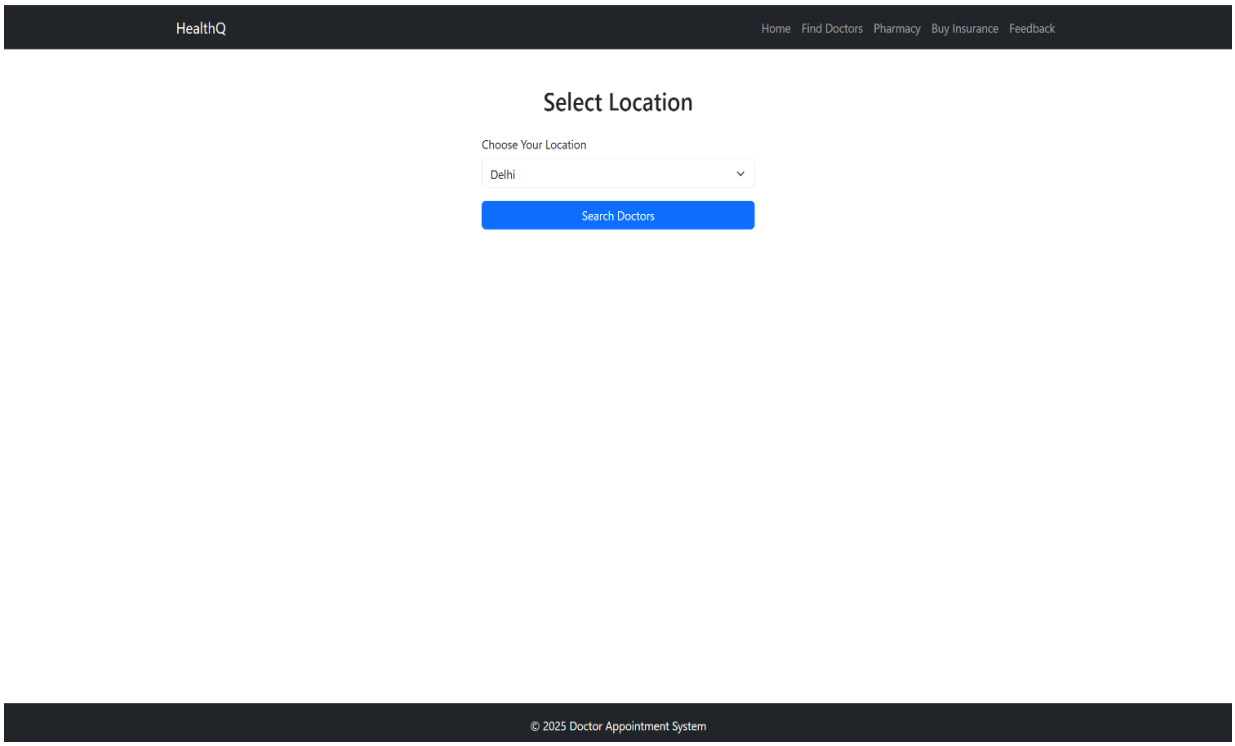

Fig. 10: *Select Location.*

Select Location

First location is selected, (figure 10)

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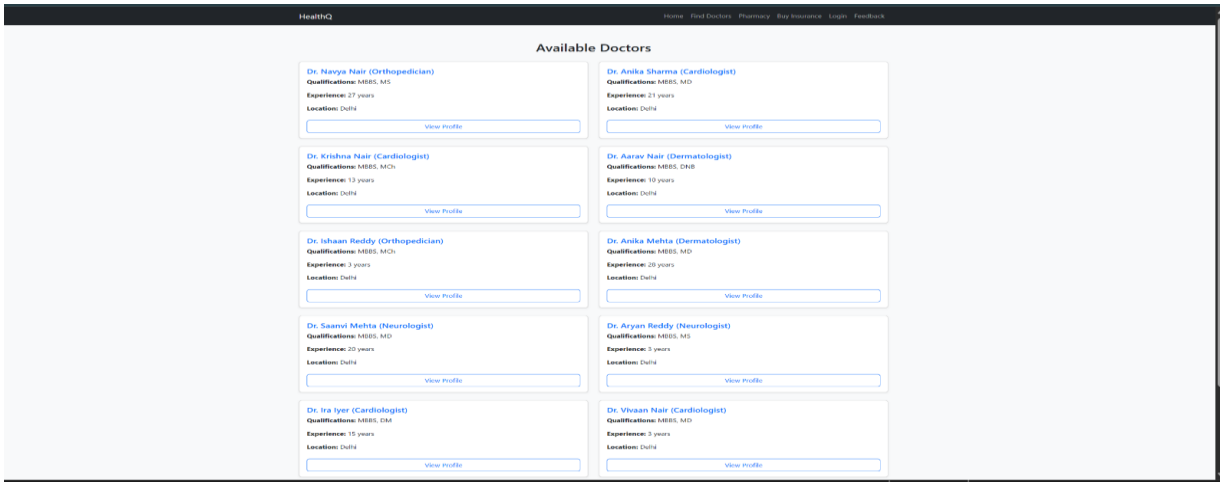

Fig. 11: *Choose Available Doctors.*

Choose Available Doctors

Then choosing doctor by department (Figure 11)

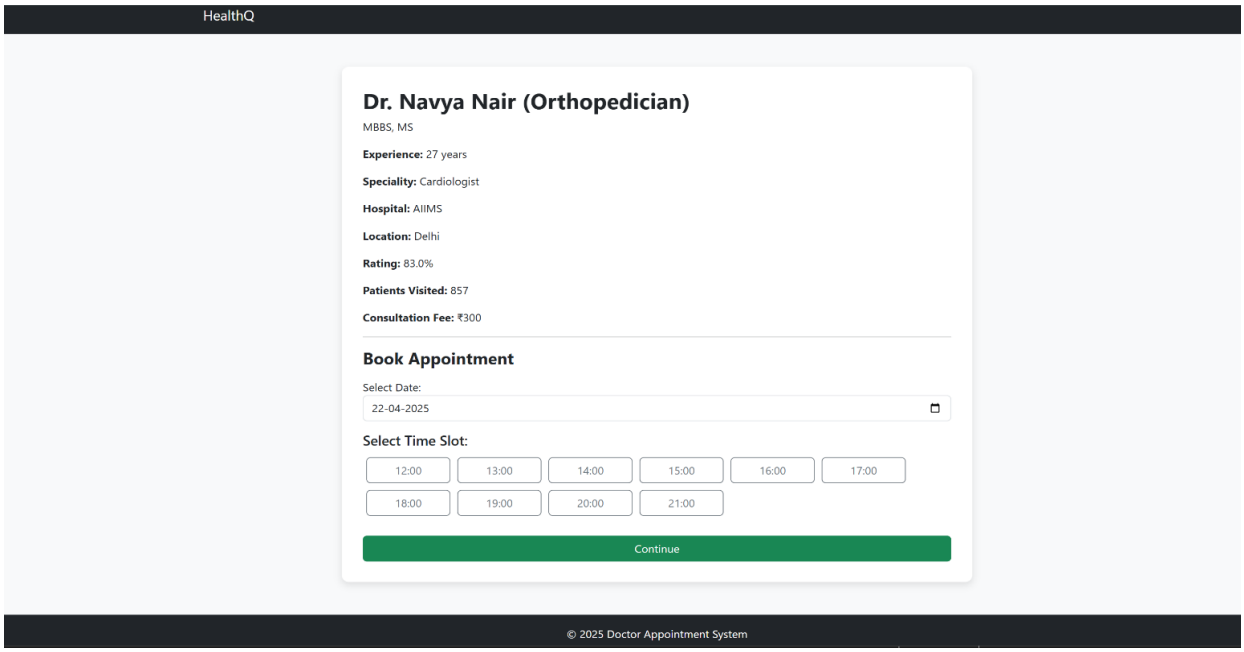

Fig. 12: *Choose date and time slot.*

Choose Date and Time Slot

Appointment is booked by choosing date and time. (Figure 12)

Fig. 13: *Enter Patient Details.*

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Patient Details
Enter Patient Details (figure 13)

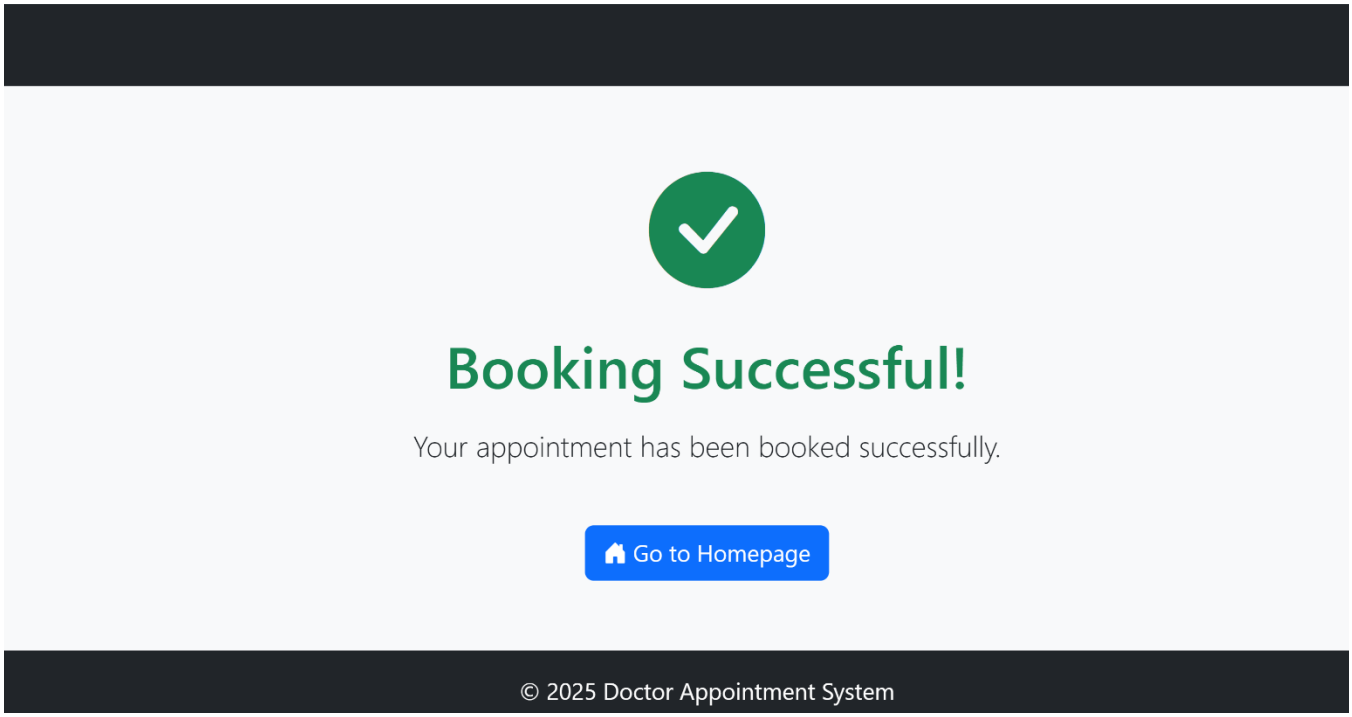

Fig. 14: *Booking Successful.*

Successful Booking
Then confirm booking (figure 14)

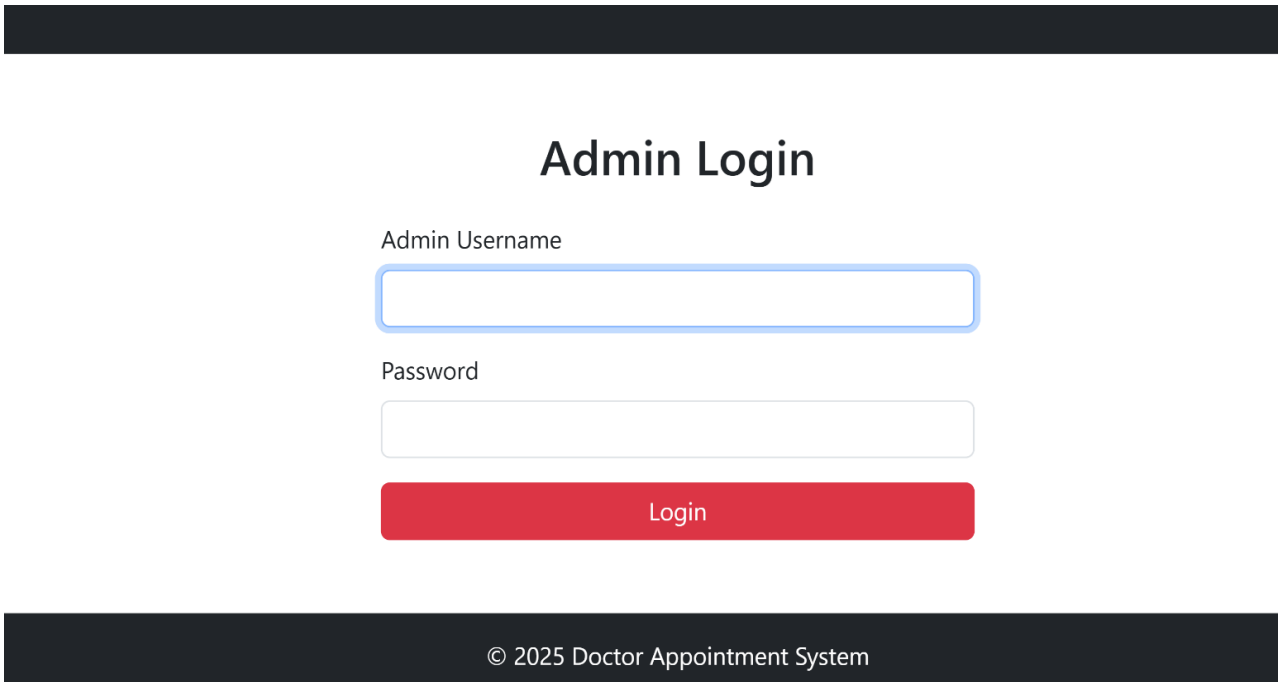

Fig. 15: *Admin Login.*

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Admin
Enter Admin Details (figure 15)

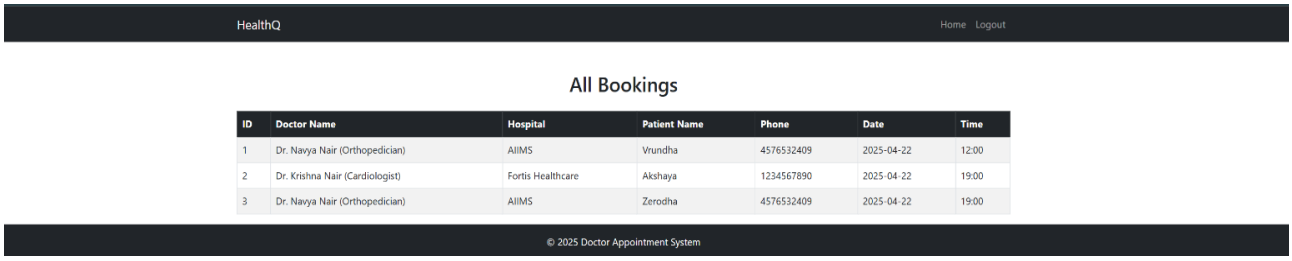

Fig. 16: *Admin Dashboard.*

Admin Dashboard
Dashboard is available to admin to check appointment list (figure 16)

RESULTS TABLE

Table 1: *Difference between Existing Features and Enhancements.*

S.no	Theme	Existing Features	Enhancements
1.	User Management	Individual Login pages admin and patients	Doctors will also have their own page to track their appointments
2.	Booking System	Booking is done online but payment has to be done at hospital	Seamless online payment can be integrated using Razor Pay
3.	Notification System	Manual emails are sent	Automatic email notifications are sent
4.	Pharmacy	List of medicines and prices are given	They can be purchased online from the website
5.	Insurance	Only different schemes are mentioned	They can be purchased online
6.	Feedback	Individual Feedback forms are provided	Online forum for patients discussions
7.	Website Interactivity	Very Basic Interface	A more improved and interactive appearance

The Table 1 outlines the current features and planned enhancements for a hospital management system. Currently, the platform offers individual login pages for admins and patients, online appointment booking with offline payment, manual email notifications, a list of medicines and prices, descriptions of insurance schemes, individual feedback forms, and a basic user interface. The proposed enhancements aim to significantly improve functionality and user experience by adding a dedicated portal for doctors to track appointments, integrating seamless online payments via Razor pay, automating email notifications, enabling online purchases for both medicines and insurance, creating an online forum for patient discussions, and upgrading the website to offer a more interactive and visually appealing interface.

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CONCLUSION

In today's fast-paced world, timely access to healthcare is more important than ever. Our hospital appointment booking website addresses the challenges faced by both patients and healthcare providers by offering a modern, intuitive, and efficient digital solution.

By automating the scheduling process, reducing administrative burdens, and allowing users to book, reschedule, or cancel appointments with ease, our platform brings convenience and transparency to the forefront of healthcare services.

For patients, the system eliminates long waiting times and complicated phone bookings, providing real-time availability of doctors and the ability to manage appointments from the comfort of their home. For hospitals and clinics, it streamlines operations, reduces no-shows through automated reminders, and improves patient satisfaction with a more organized flow of appointments.

Moreover, the platform ensures data privacy and security, adhering to healthcare industry standards to protect sensitive information. Its scalable and adaptable design also allows for integration with electronic health records (EHRs) and future technological upgrades, making it a sustainable solution for evolving healthcare needs.

In conclusion, this hospital appointment booking website not only enhances the patient experience but also supports healthcare providers in delivering more effective and timely care. It represents a step toward a more connected, accessible, and efficient healthcare system—where technology bridges the gap between patients and providers in the most seamless way possible.

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Cite as: A.V. K Akshayapriya, Dr. Gousiya Begum, Dr. K. Sreekala, & Dr. A. Nagesh. (2025). HealthQ: A Hassle-Free Solution for Hospital Appointment Booking. Recent Trends in Androids and IOS Applications, 7(2), 38–52. https://doi.org/10.5281/zenodo.15550768