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# MEDXPERT : E-HEALTHCARE SYSTEM

## *Online consultation and appointment booking system*

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***Abstract :*** This paper presents the development of a smart e-healthcare system named MedXpert - an online consultation and appointment booking application. This platform allows patients to easily book medical appointments and receive real time consultations through video calling and chat feature from comfort of their own homes. Patients can receive expert medical advice and prescription without the hassle of physically visiting a medical facility. This platform aims to eliminate the time and distance barriers that have traditionally prevented patients from accessing quality healthcare. This system is especially beneficial for individuals who live in rural areas where medical facilities are not available and also to those who have mobility issues such as disabled, blind and elderly people. With this system, general people can receive consultation with specialists who may not be available in their local areas. This smart e-healthcare system will revolutionize the way patients receive medical care.

***Keywords*** **- Consultation, Prescription, healthcare, smart e-healthcare system, Appointment, Telemedicine.**

## I. INTRODUCTION

One of the major challenges that India as a country is facing is to cater to good quality and affordable healthcare for its growing population. Telemedicine can indeed play a vital role in addressing the challenges of accessibility and affordability of healthcare in India. With the help of telemedicine, patients in remote or underserved areas can connect with medical professionals and specialists from anywhere in the country and receive timely medical attention. We know that covid-19 pandemic has presented a lot of challenges to healthcare sectors and one way to tackle them is through such systems. We also know that healthcare industries have been adapting technology but at a very slower rate compared to other industries and that needs to be changed as a delay in this sector could lead to potentially risking lives of many people. Our main aim behind introduction of this system is to promote online healthcare services. Our main objective is to enable patients to consult with specialists who may not be available in their local areas. And to reduces time, cost, and distance barrier preventing access to quality healthcare. Because we believe that quality healthcare is a right and not a luxury and it should be accessible to all.

Health is a critical aspect of our lives and neglecting it can lead to adverse consequences. The food habits and weather conditions are worsening day by day and can impact our health adversely so having a robust healthcare system is essential for ensuring that people have access to quality healthcare services when they need them. So by considering these above-discussed facts, we have developed a Consultation and appointment booking system, where Patients no longer need to wait for hours in a crowded doctor's chamber or drive long distances to get medical attention. With this system everyone can access healthcare services from the comfort of their own home, using just their smartphone or computer. This system will eliminate the need of booking appointments physically for common ailments like colds, fever, or headaches, and waiting in long queues for treatment. This system allows patients to chat with doctors, who can provide them with faster treatment, medical advice, and prescription. This will not only save time and money but also improve the quality of care.

This platform enables doctors to review patients medical records and their profiles, making it easier for them to provide an efficient and accurate diagnosis. This systems is specially beneficial to people who live in rural or remote areas where medical facilities are unavailable and prevent inconvenience to people having mobility issues such as disabled, blind and elderly people and it also helps people with busy schedules by enabling them to access quality healthcare from comfort of their own homes. Studies have shown that patients with SAD (social anxiety disorder) don't get proper treatment due to their fear of social interactions this system can help them in getting proper treatment through video consultations with doctors. Moreover, it can also assist in reducing the burden on the existing healthcare infrastructure, especially in times of pandemics and emergencies by facilitating remote consultations and diagnoses. It can be a game-changer in providing quality healthcare to India's growing population, especially in rural and underserved areas, and improving the country's healthcare ranking globally. We believe that quality healthcare is a right, not a privilege, and we are committed to making it accessible to everyone.

The development of web-based healthcare technologies can improve the health of patients by facilitating earlier and more accurate diagnoses, leading to better and more targeted treatment. This system can also help improve the efficiency of overall healthcare delivery by reducing waiting times and enabling online appointment booking, consultations, and prescription features. In addition to improving efficiency and patient outcomes, it will also prevent unnecessary hospitalizations, Therefore this platform can also help to reduce healthcare costs. This application can help to provide better access to healthcare, especially for people who live in rural or remote areas, or who do not have mobility or transportation facilities. This platform helps people who don't want to wait in long queues to book an appointment with one of the best doctors and also for those doctors who wish to consult their patients at their convenience.

## II. LITERATURE SURVEY

The demand for e-Healthcare services has increased significantly which led to many research efforts [1]. Many e-Healthcare systems have been designed and implemented. Some of them are used for special purposes, such as trauma for providing counselling [2] and Cardiology, where pervasive services and remotely distributed applications servers in the cardiology domain are used for the improvement of the early detection of cardiac diseases and their treatment[3] and therefore providing limited services for a specific group of people. The common feature in all of these systems implemented is that they provide only limited services to particular users. Our goal is not to implement an e-Health system with limited services for specific purposes, instead we are proposing a framework for general e-Health systems which can integrate most of the existing healthcare components, modules, or other healthcare-related systems. Remote consultations between doctors and patients are possible with the help of technology and are also increasingly accepted by patients. Such systems offer benefits to patients by sparing the cost and inconvenience of travel and also benefit the healthcare system by making it more cost-effective, but fears have been expressed that they may be clinically risky and they also bring significant technical, logistical, and regulatory challenges [4].

Virtual clinics via Skype have been used for counseling and mental health consultations. Skype proved really helpful in boosting self-confidence among young people aged 12–18 years with spina bifida. Feedbacks from participants suggest that they felt more confident talking about personal issues via such systems rather than face-to-face[5]. In another study on mental health, most individuals with a social anxiety disorder (SAD) do not receive proper treatment because of their fear of social interactions. Such systems hold great promise in the delivery of treatments to those who would otherwise not receive proper treatment[6]. Telephone-based consulting requires considerable skill and judgment. Studies have found that compared with traditional face-toface consulting, telephone consultations tend to focus on pre-planned themes, thereby not allowing patients to put forward their issues spontaneously[4].

Web-based applications are used to tackle some real-world challenges. The system integrates several aspects to be used by the general public, patients, doctors, and other healthcare professionals[7]. Systems are developed to help the elderly and the disabled and people who have simple flu or other diseases to gain treatment from doctors at low Doorstep rates. It is to reduce hospital admissions[8]. Systems are proposed to build a straightforward, reasonable, and productive service system within the healthcare system. This system will help to get hospital information available to people very easily[9]. A smart appointment booking system was developed to provide patients with an easy way of booking a doctor's appointment online. The purpose was to automate the existing manual system with the help of computerized equipment so that their valuable data can be stored for a longer period and can be easily accessed[10].

## III. METHODOLOGY

### 3.1 Login Process Flow

The user first enters application and navigate to login section. Two options are provided to them i.e. sign in and sign up. If they have already registered then they can sign in otherwise they will have to sign up themselves by entering required details and then sign in. To sign in user needs to enters their email and password. The user's entered credentials are then validated by the server. The validation process typically involves checking if the entered email and password match with the one stored in the server's database. If the entered credentials are valid then users are redirected to the dashboard and if the entered credentials are invalid, the server displays an error message and prompts the user to enter valid credentials.

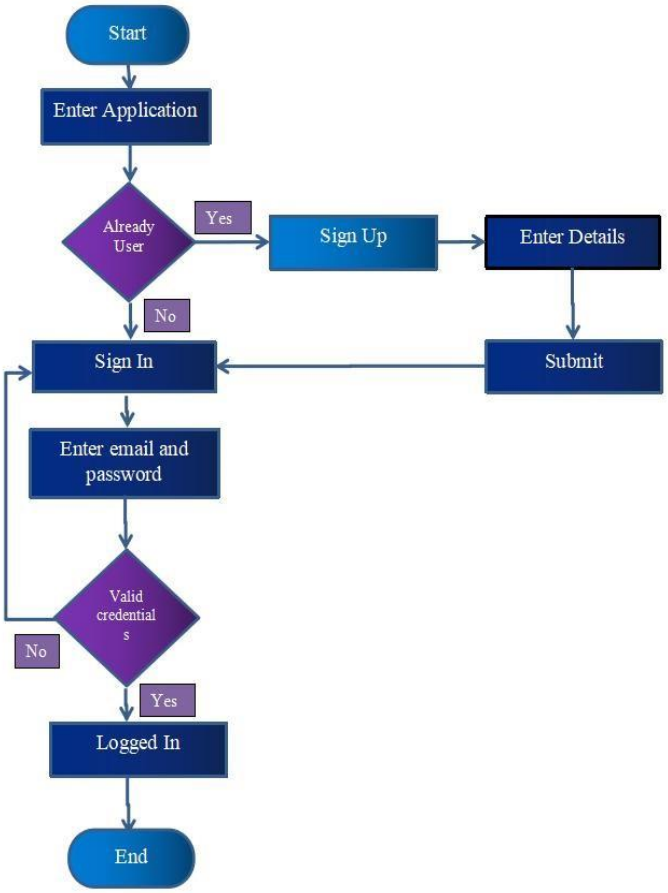


**Fig:3.1 Login process Flowchart**

### 3.2 Block Diagram

The application interface have navigation bar that consists of four sections i.e. Home, About, Register and Contact. In Register section, separate login interface is designed for doctor, patient and admin. Users can register themselves as either doctor or patients by signing up and after registration they can sign in into their account. Admin have only sign in option so admin who have correct credentials can only sign in. Doctor after registration have to wait for admins approval. Admins can either verify or unverify doctor. Patients can search for particular doctor and only verified doctors are visible to patients and they can book appointment in available slot. After appointment is booked, doctor can confirm or cancel appointment and for every confirmed appointment, meeting is automatically scheduled.

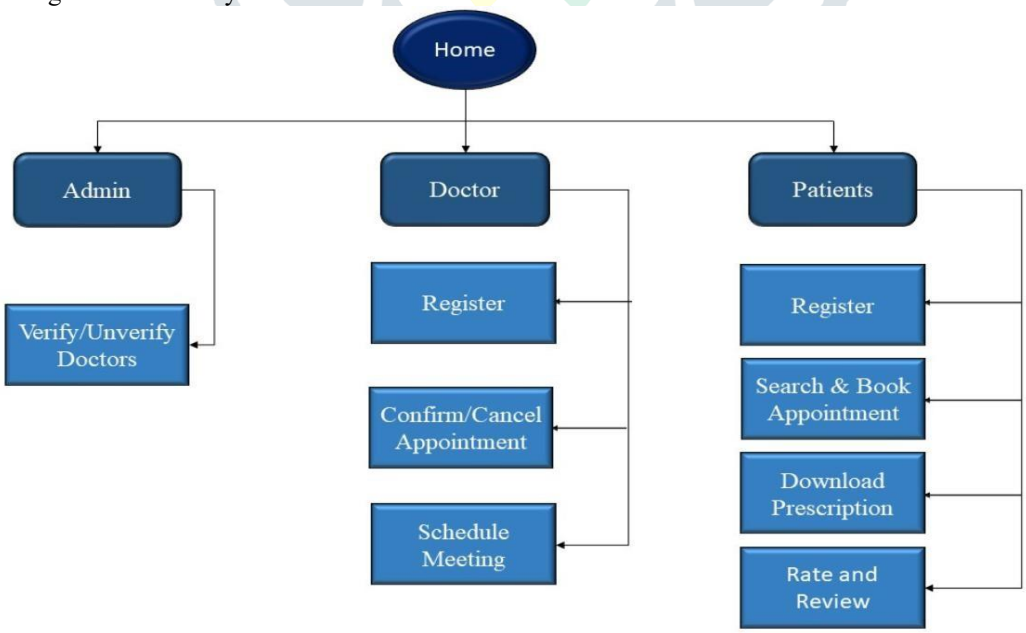


**Fig:3.2 System block diagram**

1. **Doctors/Patients/Admins have separate login:** Separate login sections are build for each user group. It provides several benefits, including improved security, customized user experiences. It also helps to ensure that sensitive information is only accessible to authorized users.

2. **Admins can verify/unverify doctors and patients:** Admins have the ability to either verify or unverify doctors and patients based on information provide by them during registration. When a doctor registers on the website, they are required to provide certain information such as registration number, registration year and State medical council number. Admin can then verify this information by going to national medical council page to ensure that the user is indeed a licensed doctor.

3. **Patients can search for any doctor according to his/her name/speciality/city:** In this system, patients have the ability to search for doctors based on their name, speciality, and city. The website display a list of verified doctors who match the search criteria. This feature makes it easier for patients to find the right doctor.

4. **Patients can book appointments in the slot provided by the doctor:** After selecting doctor, patients can book appointments in the doctor's available time slots. This feature can make it easier for patients to schedule appointments with their preferred doctor and avoid long wait times or scheduling conflicts.

5. **Doctors can either cancel/confirm appointments:** In this system, doctors have the ability to either cancel or confirm appointments made by their patients. This feature allows doctors to manage their schedule and ensure that they have adequate time to see each patient.

6. **A meeting is automatically scheduled for confirmed appointments and the notification is sent to the patient as well:** Meeting will be automatically scheduled for confirmed appointments, and a notification may be sent to the patient to remind them of the appointment.

7. **Doctors and patients have several features available to them during a meeting:** During the meeting, Doctor have several features such as the ability to view the patient's profile, chat with the patient, toggle their camera and microphone on or off, give prescriptions, and update the patient's blood sugar level. Patients also have several features such as the ability to chat with the doctor, toggle their camera and microphone on or off, read and download the prescription given by the doctor, and rate and review the doctor.

8. **Patients can also download the prescription as a PDF:** Patients can download the prescription provided by the doctor as a PDF document. This feature can be useful for patients who need to keep a record of their medications, share the prescription with their family members, or present it to a pharmacy.

9. **Admins can create posts with latest updates which will be visible to all users:** Admin can post about various health issues and latest medical treatments, raising awareness among the community.

## IV. KEY FEATURES

1) Video calling - Video calling is a useful feature that allows healthcare providers to conduct real time consultations with their patients. This feature enables healthcare providers to diagnose and treat patients remotely, which can be especially useful for individuals who live in remote or rural areas, those who have mobility issues, or for those who may not be able to visit a healthcare facility due to some other reasons.

2) Appointment booking - This system has an appointment booking system, where a patient can search for a particular doctor by their name, city or specialization. After selecting a particular doctor they can either book online or offline appointment on available slots provided by doctor. Patients can mention symptoms while booking appointments. Doctors can either cancel/confirm appointments and a meeting is automatically scheduled for confirmed appointments. The notification of scheduled meetings is sent to the patient.

3) Chat system - This system has a chat feature that allows doctors and patients to communicate with each other using a textbased messaging system. This feature is often used with a video calling system, allowing patients to ask questions, share information, and receive prescriptions from the doctor. In the chat system, both doctors and patients can see each other chats. These chats are stored in Firebase firestore in the chats collection.

4) Prescription - Doctors can provide prescription in prescription section in the meeting itself. Patients can read and download the prescription in PDF form, but they are not allowed to edit the prescription. We have used JsPDF to add this functionality.

5) Blog Section - The platform also features a blog section where the admin can regularly post about various health issues and latest medical treatments, raising awareness and providing helpful tips to the community.

## V. TOOLS AND TECHNOLOGY

This system is built using Node.js in the back-end and React.js in the front-end, ensuring seamless performance and enhanced user experience. Node.js is a open source, back-end JavaScript run time environment and React.js is open source JavaScript library. The system's web components are crafted using technologies such as HTML, JavaScript, CSS, and Material UI. Material UI is a popular open-source library of React components for building user interfaces. The system also incorporates the use of Socket.IO which is a JavaScript library that enables real-time, bidirectional communication between web clients and servers. This system uses simple-peer enables patients to communicate with doctors in real time.

library of WebRTC whichThe platform is user-friendly, efficient, and secure. It is powered by Firebase which is a cloud-based platform that provides range of services for building and managing applications. Firebase firestore is used for providing a reliable and safe way for patients to store and access their medical records.

## VI. RESULT AND DISCUSSION

A Uniqueness

There are many e-healthcare applications available that provide consultation. But in this system, we have added some features which make it unique from other existing systems. We have designed separate logins for doctors, patients, and admin. Admins are responsible for the verification of doctors. Doctors can either cancel/confirm appointments based on their availability and patients can book online as well as offline appointments in the time slot provided by the doctor. Prescription is made available to the patients in PDF format. Every login, consultation, chat, and prescription is stored in the database. B Results

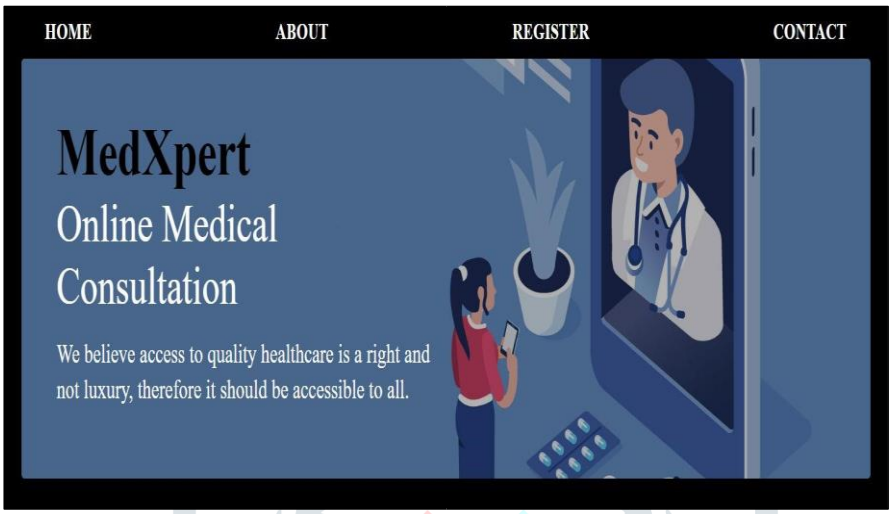


**Fig 6.1: Home Page**

Figure 6.1 represents the home page which consists of a navigation bar that helps in navigation between different sections such as About, register, and contact

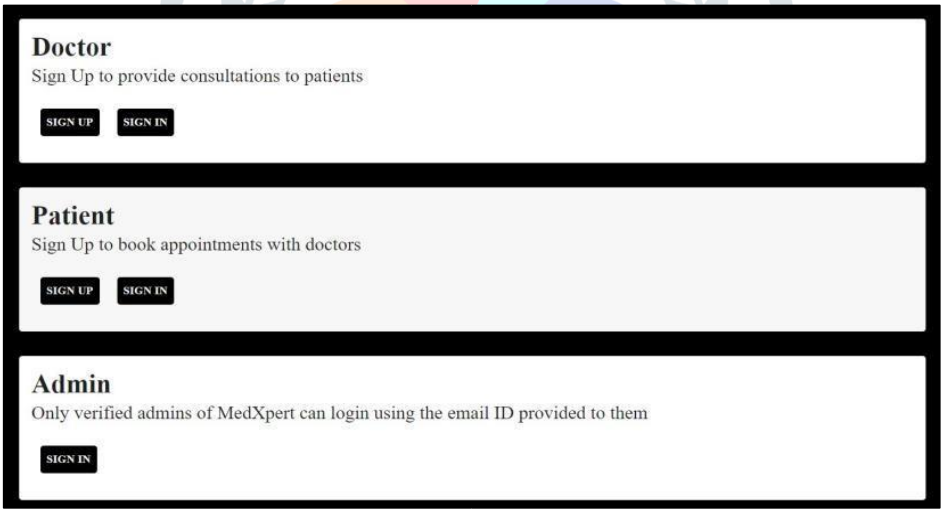


**Fig 6.2: Login Page**

Figure 6.2 represents the registration section which consists of separate logins for admins, doctors, and patients

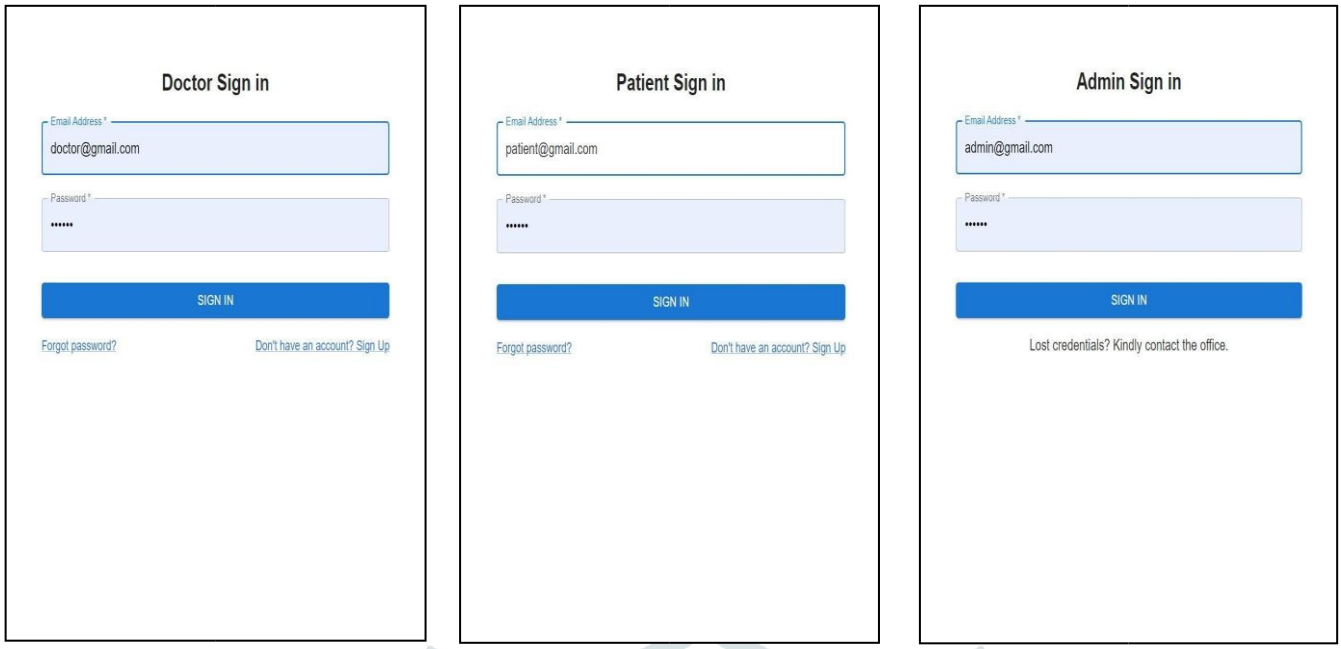


**Fig 6.3: Sign in Page for doctor, patient and admin**

Figure 6.3 represents login page allows a user to gain access to an application by entering their username and password

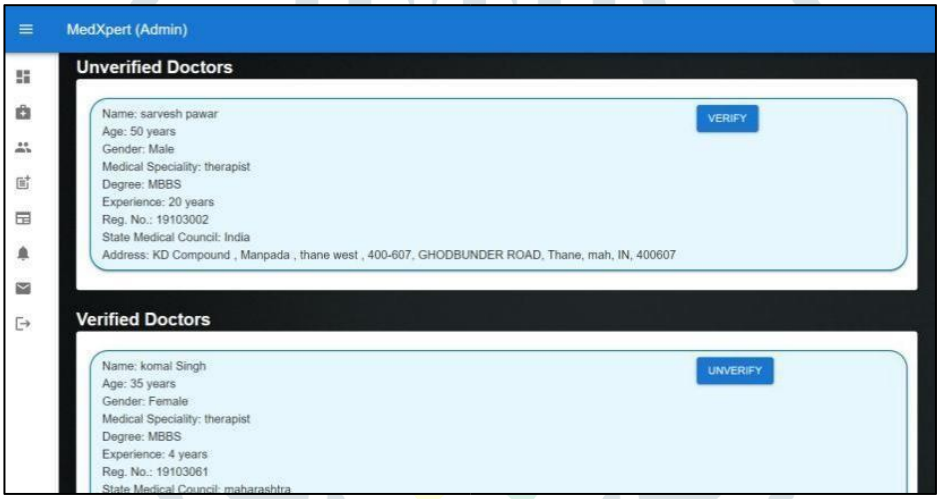


**Fig 6.4: Doctors verification page**

Figure 6.4 represents the doctor's verification page, where admins can either verify the doctors or unverified them based on registration no. and medical council no. provided by doctors by visiting the National Medical Council page.

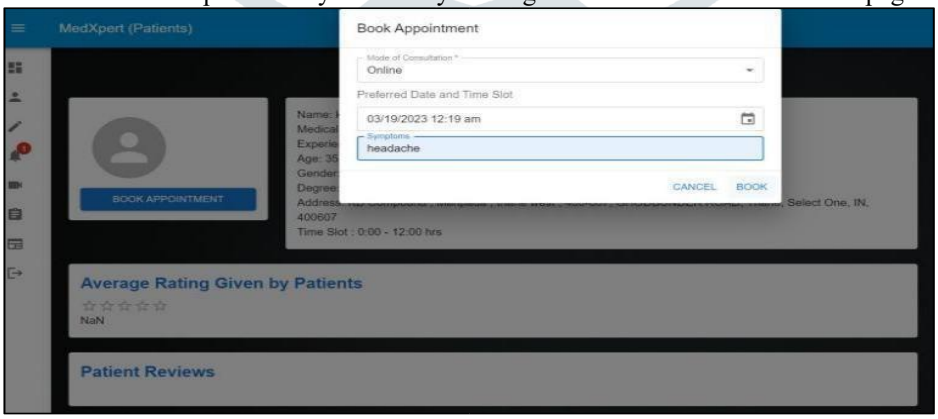


**Fig 6.5: Appointment Booking**

Figure 6.5 represents the appointment booking page, where patients can search for doctors by their name, city, or medical specialization and book an appointment in the available slot provided by the doctors.

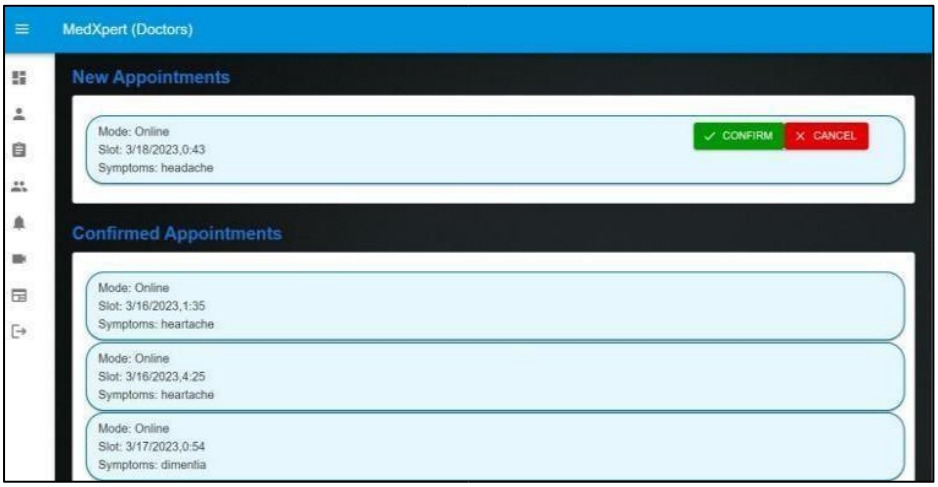


**Fig 6.6: Appointment confirmation**

Figure 6.6 represents the appointment confirmation page, where doctors can either confirm or cancel an appointment. This will allow them to manage their schedule.

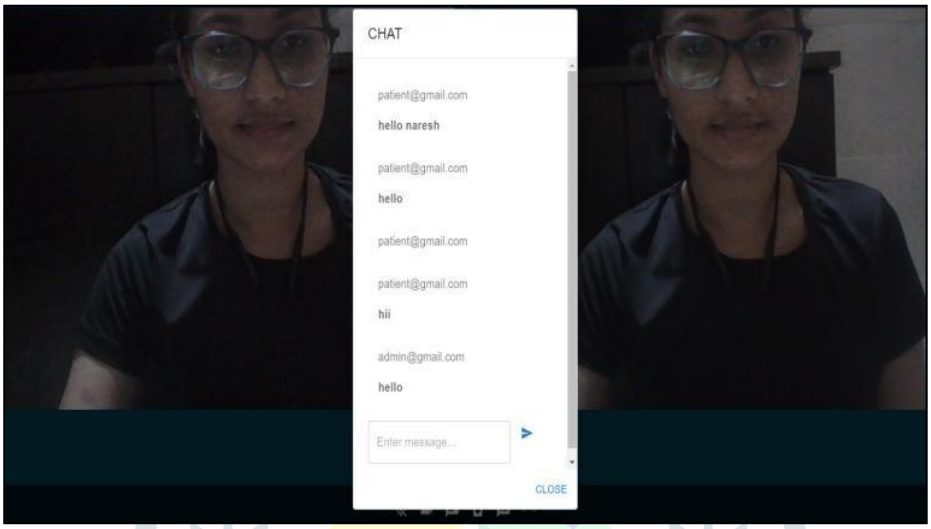


**Fig 6.7: meeting room**

Figure 6.7 represents the meeting room, a meeting is scheduled as soon as the appointment is confirmed. Patients can consult with doctors and doctors can view the patient's profile and provide prescriptions in the meeting itself

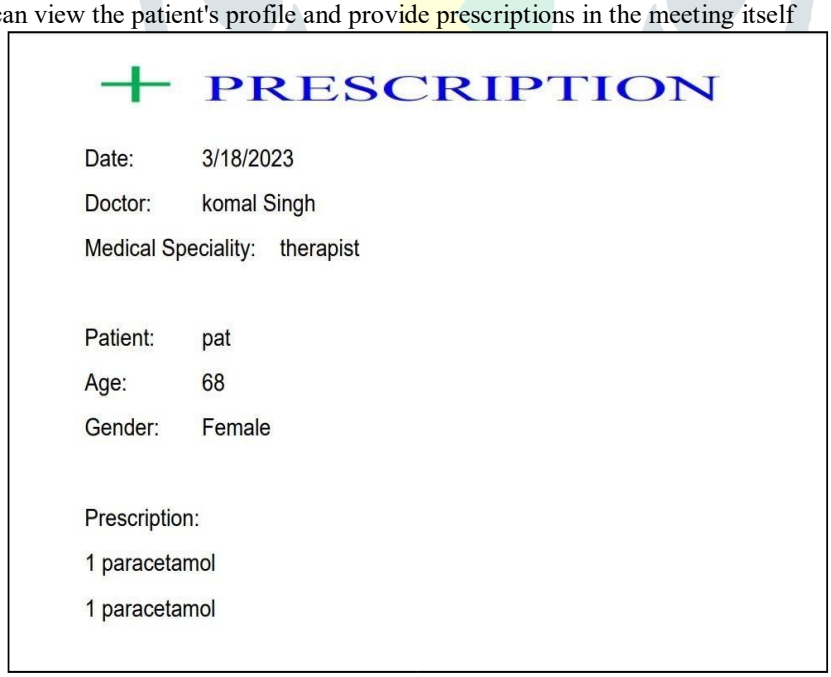


**Fig 6.8: Prescription in PDF form**

Figure 6.8 represents prescription PDF that contains information of doctor and patient and prescribed medication.

## VII. CONCLUSION AND FUTURE SCOPE

This System is a web-based consultation and appointment booking platform that leverages the power of technology to improve access to healthcare services for people all over the world. By enabling patients to receive medical attention from the comfort of their homes, this system is not only saving time and money but also reducing the burden on the healthcare system. With the use of

video calls and chat features, this system is making it possible for doctors to treat patients who live far away from hospitals such as people living in remote or rural areas. It is also beneficial to people who cannot travel due to illness or disability i.e. people with mobility issues. This platform provides affordable and accessible healthcare services. In short, this system is a powerful tool that will transform the healthcare industry by making it more accessible and convenient for patients.

In future, transaction system can be integrated in the platform to provide mobile payment option that will offer seamless and convenient payment experience to users. IOT technology can also be used to collect real time data and sent it to Healthcare system that has the potential to transform Healthcare industry.

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