



University of Bahrain  
College of Information Technology  
Department of Computer Science

# Dental Clinic System

Prepared by  
Mohamed Isa Hasan 202002725  
Ahmed Mahood Mohamed 202005802  
Ali Mansor Abdali 202005568

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Project Supervisor: Dr. TAHER SALEH KHAID HOMEED

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## **Abstract**

Dental clinics are very high on demand in Bahrain compared to other types of clinics, due to the high number of dental clinics in the country and the fact that their procedures are easy and light weight compared to other clinical procedures, making it hard for the dental clinics to keep up with management of the appointments with their patients. And that is where the dental clinic systems are required, but the older systems that are already in use in most places only have the faculty side of the system leaving the appointment booking problem unresolved. Our system is a mobile application of a dental clinic system and online booking function as well, making the booking process much simpler, since the system deals with the faculty side of the system automatically.

## **Acknowledgement**

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# **Chapter 1**

## **Introduction**

The Dental Clinic System (DCS), consisting of five users. The faculty side users (admin, receptionist, dentist, x-ray dentist) and, the customers (patients). Each user of the system is capable of their individual list of capabilities. For example, admin can register any type user type, while the receptionist can only register patients and the other users can't register. The aim of this project is to make appointment booking and appointment management an easier process for patients and clinics faculty members.

### **1.1 Problem statement**

The system will should allow the patients, receptionists, and the system administrator to book appointments through the application. And the dentist, x-ray dentists should be able to view their appointment schedule and notify patients for their upcoming appointments. Receptionists can view every user's (dentists, x-ray dentists, and patients) appointment schedule individually. Administrator can view appointments of the whole system. Administrator, receptionists, and patients should be able to modify (change date) and cancel appointments. There is a chat functionality that allows patients to talk to one of the receptionists or the administrator in the case of having a problem with application.

### **1.2 Project objectives**

- Patients can book appointments any time very easily due to the online application.
- Clinic faculty members can on their other tasks because the system will handle most of the appointments management work.
- Less paperwork since records are stored in the database and can be viewed in the system.
- Allow the Administrator to register users of the system and monitor the system.
- Dentists can view their work schedules and request x-ray if patients needed it.
- X-ray dentists can attach images to appointments.
- Receptionists can register patients, book appointments, and view records.

### **1.3 Significance of the project**

The Dental Clinic System (DCS) is one of the rare clinic systems in Bahrain where the patients are users of the application, making The DCS an unfamiliar system. Although same as the online food ordering application people were reluctant to using them, but now people are using more than the older methods, in fact very few people now use phone calls to order food. So, the vision of this application is to share the online appointment booking to make appointment booking and appointment management a very efficient and effortless process.

### **1.4 Report outline**

A description of the Dental Clinic System (DCS) and other related applications is viewed in Chapter Two using data gathered from interviewing system users and reviewing already existing systems. Additionally, the project report's Chapter Three describes the project management elements, including the process model that was chosen for the project and the rationale behind the decision. The project activities plan, and risk management are also covered in this chapter. To develop a DFD and Class Diagram, the requirements must be collected and carefully analyzed, which is covered in the fourth chapter. The system's design will be broken down in the fifth chapter, and in the sixth chapter, the design will be turned into a software system and tested. Finally, the conclusion will address whether the project's goals have been met.

## Chapter 2

### Literature Review

An accurate and comprehensive study of the existing literature is essential before beginning any specific investigation. In order to lay the foundation for the investigation, this necessitates summarizing earlier findings and studies. A literature review can help one become more knowledgeable by examining key ideas, methodologies, and practical applications. The purpose of the literature review, in the context of our research, is to provide a solid grasp of the current Dental Clinic Systems (DCS's) that are currently available and the continuing discussions in the industry. The behavior, characteristics and key attributes of Dental Clinic Systems (DCS's), such as their security, usability, scalability, availability, and performance, will be the main emphasis of this research.

#### 2.1 Related Systems

##### 1- [gems dentalcenter.com](http://gems dentalcenter.com)

According to G.E.M.S. Center (2023) website it is a dental clinic center in Bahrain they built their own original system for their clinic.

Advantages	Disadvantages
Modern interface design	No mobile application for the system
You can easily view information about the clinic and the dentists	Patients can't register in the website, they have to fill their information every time to book an appointment
Easy navigation	Doesn't provide the availability of the booked date and time

Table 2.1: Advantage and Disadvantage of G.E.M.S. System

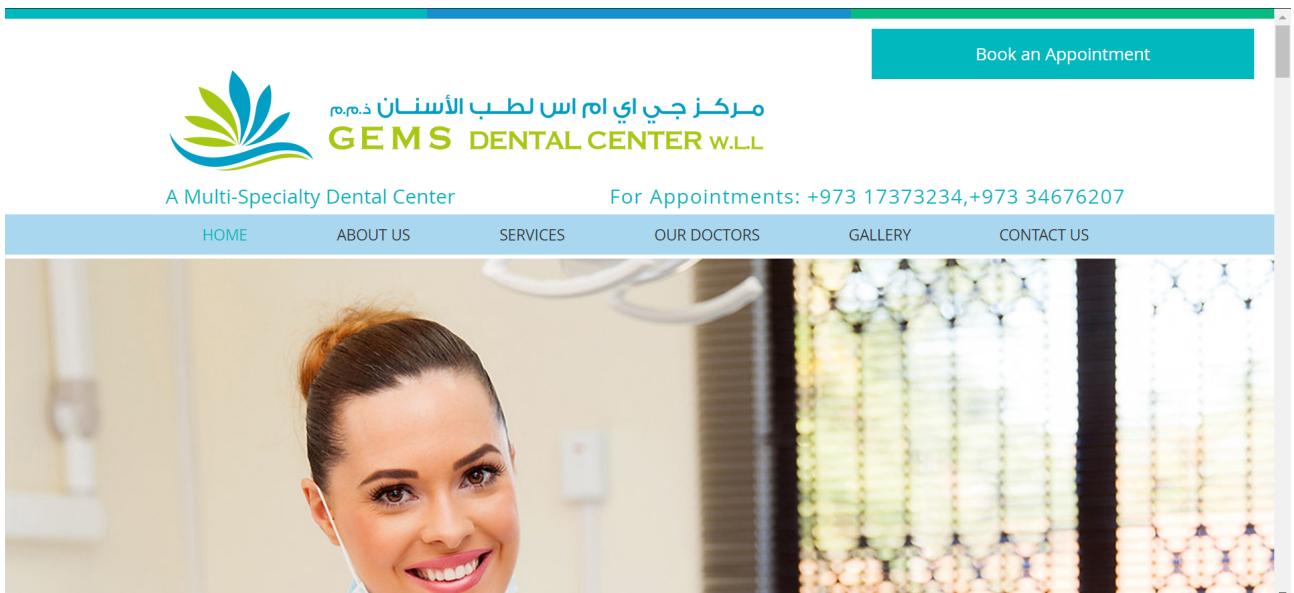


Figure:2.1 G.E.M.S. System Interface

## 2- Invent emr

Invent EMR (2024) is a medical system provider, They provide a specialized systems, that are based from their original app for their client (clinic centers).

Advantages	Disadvantages
A cloud-based system	No online appointment booking system
Efficient way of managing appointments (deleting appointments and modifying their information)	Patients have to contact the clinic manually for any inquiries they, can't use the system
Centralized patient records	Old interface design

Table 2.2: Advantage and Disadvantage of Invent System

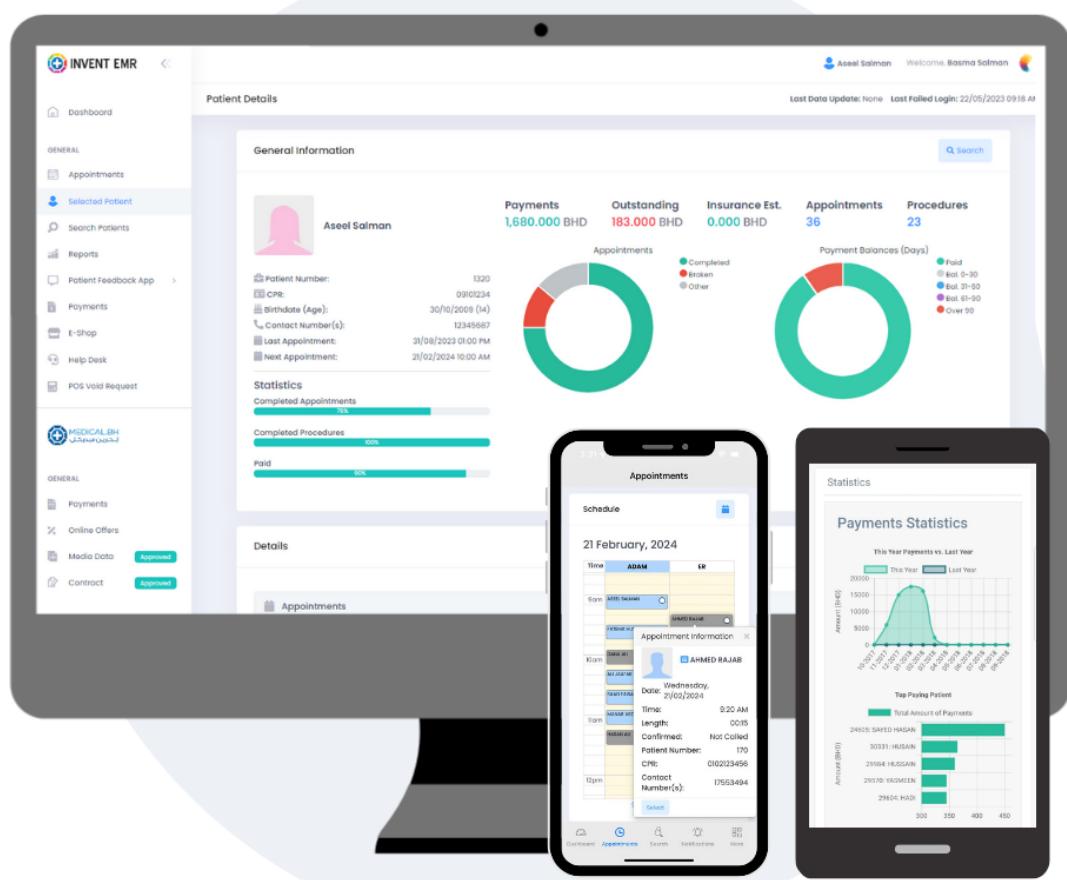


Figure:2.2 Invent EMR System interface

### 3- Alawi Dental Center

Alawi Dental Center (2022) is a Website similar to G.E.M.S. System in which they have built their own system

Advantages	Disadvantages
Modern Interface design	no handheld app for the system
Easy view to the Clinic and dentist information	Does not provide an online booking appointment just fill the information without knowing about the available date and time.
Provide a description for each type of service that the clinic provide	Hard to communicate with the clinic staff

Table 2.3: Advantage and Disadvantage of Alawi Dental Center

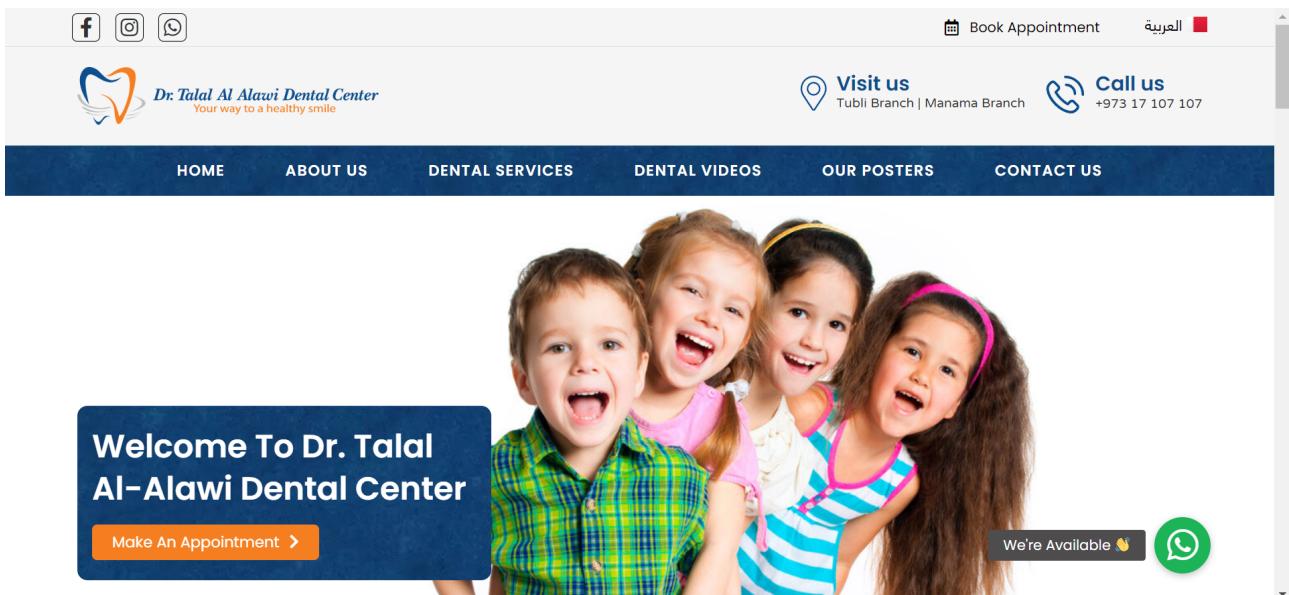


Figure:2.3 Alawi Dental System interface

## 2.2 Literature review

Invent emr is used in most medical clinics in Bahrain it has gained its popularity, because it is very advanced compared to other medical clinics systems in Bahrain, it is a cloud-based system which adds to the demand for it, the main draw back of the system is the fact that it's an old system making their interface not user friendly compared to new modern systems, other than that they crammed every process in medical clinics in one system appointment management, inventory management, and medical procedures and other processes all in one system. Which could cause some confusion, conflicts, and the fact that the system can't be superior in all aspects, which is why clinics don't usually take the whole invent system they only take it for

the appointment management. On the other hand G.E.M.S. system is a personal system it has a better user interface than invent systems, but it's appointment booking functionality is the efficient since patients have to fill their information every time they want to book an appointment and there is know way to know the availability of the dentists as well as you can't chose the dentist you want to book your appointment with.

## Chapter 3

# Project Management

### 3.1 Process Model

A model of a software process is an illustration of the actual process that is being described. Tasks that are a part of the software process, the software product, and the duties of those participating in software development can all be included in process models.

We chose the Waterfall model mainly for it's flexibility and adaptability.

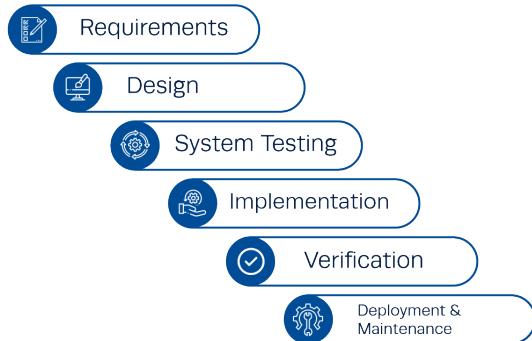


Figure 3.1: Waterfall Model

The waterfall model consists of six major phases: requirements analysis, design, implementation, testing, deployment, and maintenance. It begins with massive planning , then moves on to document all project requirements. These requirements form the basis for developing a structured design. During the implementation phase, coding and integration are done immediately. A full set of tests are run to ensure that the system meets all requirements and works effectively. Following deployment, maintenance is carried out to address any issues and apply updates. Stakeholders play a vital part in the early stages of development, testing, and deployment to ensure that all criteria are met and to aid in systematic problem resolution.

## 3.2 Risk Management

The process of identifying, evaluating, and controlling risks to an organization's assets and profits is known as risk management. These risks arise from a different sources, including possible financial risk, legal requirements, technological problems, inadequate strategic management, accidents, and natural disasters.

### 3.2.1 Risk Identification

This means identifying predicted hazards that affect the group or business, such as the operational, financial, and security risks.

RID	Risk Type	Possible Risk
1	Data Breaches	Dental offices retain private patient data, such as medical
2	Data Loss	Service disruptions and data loss could result from natural disasters such fires or storms damaging clinic buildings, equipment, or data centers.
3	Employee Mistakes	Data breaches and compliance violations can be caused by human error, such as incorrect handling of patient data or disregard for security procedures.
4	System Downtime	System outages could be caused by infrastructural problems or technical malfunctions, which would impair staff productivity, patient care, and appointment scheduling.

Table 3.1: Risk Identification

### 3.2.2 Risk Analysis

Assessing the likelihood and potential effects of the risks mentioned and prioritizing them.

Risk	Risk Probability	Risk Impact
Hacker Access	High	High
Backup Failure	Medium	High
Email Error	Medium	Small
Power Outage	Medium	Medium

Table 3.2: Risk Analysis

## Chapter 4

### Requirement Collection and Analysis

This chapter will describe how to put together the system requirements and how to examine the results by breaking down the requirements into functional and non-functional categories. The system's user functionalities will be collected by interviewing users of implemented system users, and reviewing already existing systems. Following analysis, the data will be converted into a Class Diagram and a DFD.

#### **4.1 Requirement Collection**

One of the most important steps in our project to create our system is requirement collection. To that end, we will do interviews and review existing systems to gather our system needs that will help us reach our objective.

##### **4.1.1 Interview Questions**

###### **4.1.1.1 Receptionist**

1. how do you register a patient into the system?
  - By enter cpr info into the system to add patient
2. how to create a new appointment?
  - By using the cpr of the patient you and filling the appointment information.
3. how can you view the appointments schedule?
  - You view the upcoming appointments in the home page for each dentist with the appointment details.

###### **4.1.1.2 Administrator**

1. what are the capability of the administrator?
  - The administrator can book , modify and cancel appointment. also can register both facility and patients.
2. what are the types of your system?
  - Administrators, dentist and receptionist
3. how to register a new facility member?
  - Each facility member is register individual you have to enter the personal information of the user and specify the capability of the user?

4. what is the name of the system used in the clinic?  
 -For appointments we are using invent system but for inventory management and other tasks we are using other system.
5. What is the closest time to the appointment in which you can cancel the appointment?  
 -You can cancel the appointment at any time because you have to consider patients situation.
6. is the payment process included in the appointment system?  
 -No , all of the accounting process of the clinic is managed by a system called odoo system.

#### **4.1.1.3 Dentists**

1. how do you use the system?  
 -I can attach x-ray images and prescription to treatment record.also view the upcoming appointment for my schedule and view patient treatment record.
2. what can you see exactly in the patient treatment record?  
 - Prescription, x-ray image and treatment type.

## **4.2 System Requirements**

must be aware of the client's expectations and requirements regarding the program, as well as to comprehend exactly what needs to be done throughout implementation. There is now a list of both functional and non-functional requirements.

### **4.2.1 Functional Requirements**

The services that the software offers are known as functional requirements, and they focus on how the application is meant to operate technically.

#### **Administration Requirements**

- The Administrator should be able to book appointments.
- The Administrator should be able to modify appointments.
- The Administrator should be able to cancel appointments.
- The Administrator should be able to register new faculty members.
- The Administrator should be able to register new patients.
- The Administrator should be able to reply to patients inquiries.

## **Dentist Requirements**

- Dentists should be able to attach prescriptions to appointments.
- Dentists should be able to view his/her appointment schedule.
- Dentists should be able to view a patient's treatment record.

## **Receptionist Requirements**

- Receptionists should be able to book appointments.
- Receptionists should be able to modify appointments.
- Receptionists should be able to cancel appointments.
- Receptionists should be able to register new patients.
- Receptionists should be able to reply to patients inquiries.

## **Patient Requirements**

- - Patients should be able to book appointments.
- Patients should be able to modify appointments.
- Patients should be able to cancel appointments.
- Patients should be able to view his/her appointments history.
- Patients should be able to register an account into the app.
- Patients should be able to contact staff for any inquiries.

### **4.2.2 Non-Functional Requirements**

Non-Functional Requirements focuses on the characteristics of the software itself rather than how it is supposed to function. Non-functional requirements are the non-technical requirements of the software.in addition to that the Non-functional requirements is a testable property of the system and recognize how it fits the needs of the stakeholders.

#### **1. Security:**

- The system should guarantee the transfer and storage of patient data in an encrypted state.

- the system should use encryption and other security measures to protect any unwanted access to patient data

## 2. Usability :

- The system should provide guidance and allow users to easily correct errors
- the system should reduce the amount of redundant scheduling and data entry to increase user productivity

3. **Scalability** : the system should be scalable to handle the expansion of the dental practice, including the addition of new clinics, doctors, and patients.

4. **Availability** : The system will have backup servers for continuous operation.

5. **Performance** :The system should support a huge number of concurrent users and appointments. A good user experience should be ensured by having minimal response times for crucial processes like scheduling appointments and getting data.

## 4.3 Personas

the following personas are all imaginary

**Name:** Sarah

**Background:**

Sarah is a 28-year-old marketing professional who believes in taking good care of her health. She lives in a metropolitan city and juggles between her busy work schedule and maintaining a balanced lifestyle.

**Demographics:**

Single

Lives in an urban city Holds a bachelor's degree in business administration.

Works full-time

**Scenario:** Although Sarah has been taking good care of her oral health, she frequently runs into problems making appointments and organizing her records. She searched for a solution but was unsuccessful until she came across DCS's handheld application. She had at last discovered the flexibility she required to effectively schedule her appointments. Sarah may simply schedule visits with several dentists, move between dental offices, and update her personal data with DCS.

**Name:** Dr. Alex

**Background:**

Dr. Alex is a highly skilled dentist who takes immense pride in providing excellent patient care. Despite his proficiency in his field, he sometimes struggles with administrative tasks such as scheduling appointments and recording patient information accurately. He operates in a busy

urban setting and is always on the go.

**Demographics:**

40 years old

Works in a bustling city Holds a Doctor of Dental Surgery degree. Runs his own dental practice.

**Scenario:** Dr. Alex is a superb dentist, but he has trouble remembering to schedule his visits and frequently overlooks properly record patient information. He is keen to discover a way to guarantee accuracy and timeliness while streamlining patient care. Fortunately, he discovered DCS, which enables him to use a portable device to record his attendance. To provide effective patient care, he can also access patient records while on the go, open slots for urgent situations, and revise treatment plans instantly.

**Name:** Dr. Emily

**Background:**

Dr. Emily is a skilled and efficient dentist who values organization and speed when dealing with patient records and X-ray images. She is known for her meticulous attention to detail and her commitment to maintaining the privacy and security of her patients' sensitive data.

**Demographics:**

35 years old

Specializes in dental radiography. Works in a large dental hospital Holds a degree in dentistry with a specialization in radiology.

**Scenario:** When it comes to patient records and X-ray images, Emily, the dentist, appreciates efficiency and organization. She would rather use a mobile application that protects sensitive data, gives her rapid access to patient data, and lets her react quickly to changes in treatment plans. Thankfully, DCS satisfies all her needs, offering her a flawless workflow for organizing X-ray pictures, recording conclusions, and coordinating with other dental specialists.

**Name:** Michael

**Background:**

Michael is a diligent and customer-focused receptionist at a bustling dental practice. He takes pride in delivering excellent customer service while efficiently managing patient appointments and answering a range of inquiries. His interpersonal skills and his ability to multitask make him a key member of the clinic's administrative team.

**Demographics:**

28 years old

Works full-time at a busy dental office Has a diploma in Medical Office Administration Scenario:

At the dental office, Michael works as a receptionist and aims to give great customer service while effectively scheduling patient appointments and answering questions. He's searching for an app that makes checking in easier, lets him manage payments and invoices easily, and gives him real-time appointment schedule updates. Luckily, Michael can effectively handle patient check-ins, handle payments, and communicate with other staff members and dentists using DCS guaranteeing a smooth experience for patients.

**Name:** Sophia

**Background:**

Sophia is a meticulous and dynamic clinic administrator who manages a busy dental practice. She excels in staff management, clinic operations, and ensuring the overall smooth running of the clinic. Sophia takes pride in her ability to maintain the high standards of care that the clinic is reputed for.

**Demographics:**

35 years old

Full-time Clinic Administrator at a well-established dental practice Holds a Bachelor's degree in Healthcare Administration

**Scenario:** Sophia, the clinic administrator, oversees managing staff and making sure the dental clinic runs well. She appreciates a system that gives her access to all management tools, lets her keep an eye on employee attendance, and gives her performance data for the clinic. With DCS Sophia can effectively oversee staff schedules, monitor patient flow, produce reports on clinic operations, and guarantee regulatory compliance—all of which help her uphold the clinic's high standards of care.

## 4.4 System Models

System modelling is done by various methods and its goal is to give a clear and direct visualization of the data flow, and data store in the system. We will be using the Data Flow Diagram (DFD) to show the flow of the data from one process to another in the system. For data storing we will make a Class Diagram to represent the database and showcase the relationship between every object of the stored data.

### 4.4.1 Data Flow Diagram (DFD)

Dataflow diagram is a neat representation of the system's data being transported thorough the system from users to processes and processes to the database and vice versa. And it's easily understood by everyone even for people not proficient in technical fields due to its simplicity. And it is illustrated by the following components:

- Process: it is a component that contains abstract operations and functions, a process module gets divided into multiple more specific processes with every DFD level
- External Entity: is usually the users of the system which makes the physical factor of the system, who interact with system by giving it various inputs and receiving outputs.
- Data Store: is a storage module and it represents an entity of the database which could be a collection or a table of an object in the database.

- Data Flow: the data flow is the information transportation part of the system, this is the most important part of the DFD and the most obvious part, it is shown by drawing arrows that are directed from one of the previously mentioned components ( Process, Data Store, External Entity ) to another, connections can be from an entity or data store to a process or the other way around, and it could be from a process to a process but we did not need this type for our case.

#### 4.4.1.1 Context Diagram

The first level of the DFD is the context level, it showcases the system in very abstract and primitive way where it only shows a general flow of the data in the system represented by one process connected to all the external entities of the system, with no data stores in the diagram.

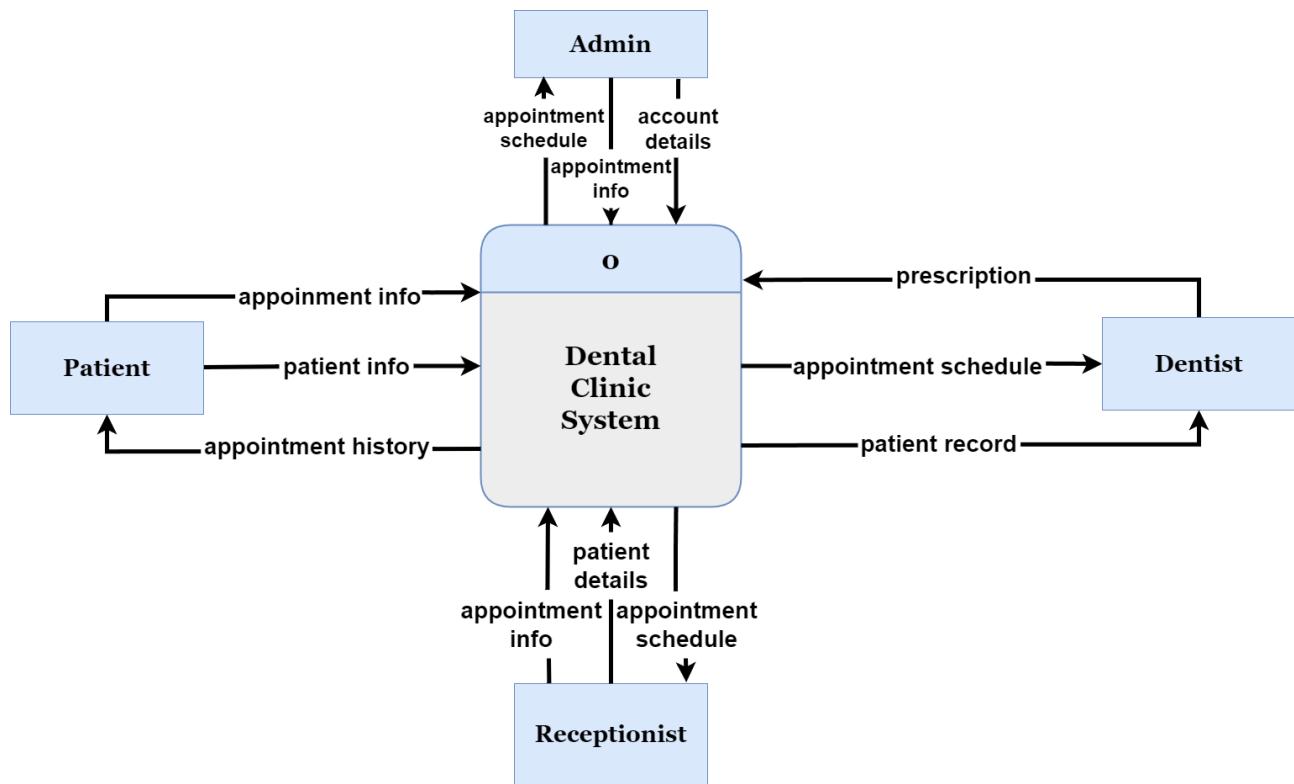


Figure 4.1: Context Diagram

The figure shows the context diagram of our Dental Clinic System, it shows the basic interactions of every user with the system, administrators must enter users data into the system to register them, patients can also register into the system by themselves and they can be registered by receptionist as well. dentists can view their own schedule as well as any patient treatment record, Administrator and receptionist can view all the appointments history of the system,dentists can attach x-ray images to appointments, and can attach prescriptions to appointments. Patients, administrators, and receptionists can book appointments.

#### **4.4.1.2 Data Flow Diagram Level 0**

This level of the DFD is give much more information than the context diagram, and it may seem overwhelming at first, because its large compared to the context diagram but we tried our best to design it to be clear and easy to understand.

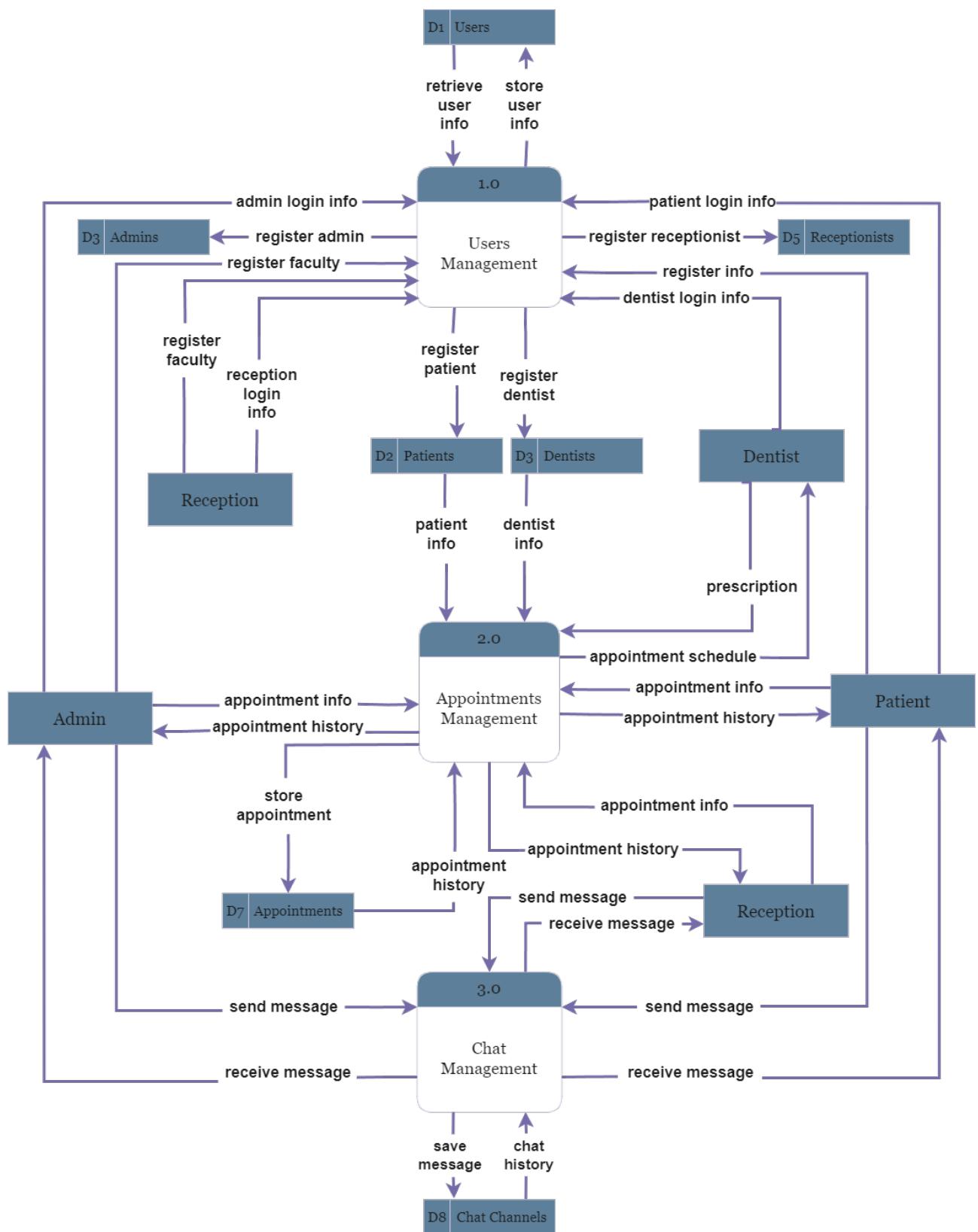


Figure 4.2: DFD

The figure shows us the level 0 DFD containing the following processes.

1.0: Users Management: a process that contains every process and function that are related handling users account management, for example login and register.

- Administrator:

- \* Can register users accounts.
- \* Can delete faculty users accounts.
- \* Can login.

- Reception:

- \* Can register patients.
- \* Can login.

- Patient:

- \* Can register.
- \* Can login.

- Dentist:

- \* Can login.

2.0: Appointment Management: this process is for maintaining appointments related data and operations. This is the most important process that handles most of the functional requirements of the project.

- Administrator:

- \* Can view appointment history.
- \* Can book appointments for patients.

- Reception:

- \* Can view appointment history.
- \* Can book appointments for patients.

- Patient:

- \* Can view his/her appointment history.
- \* Can book appointments for patients.

- Dentist:

- \* Can view his/her schedule.

- \* Can view a patient's treatment record.
- \* Can attach prescriptions to appointments.
- \* Can attach x-ray images to appointments.

3.0: Chat Management: the chat management process is a small process that allows patients to contact the clinic faculty through the app. The goal of the chat process is to allow patients to ask the administrative staff for help regarding the app, and general info about the clinic.

- Administrator:

- \* Can reply to patient's inquiries.
- \* Can receive patient's messages

- Reception:

- \* Can reply to patient's inquiries.
- \* Can receive patient's messages.

- Patient:

- \* Can send messages to the clinic's faculty (Receptionists, and Administrators).
- \* Can receive messages to the clinic's faculty (Receptionists, and Administrators).

# Chapter 5

## System Design

Creating systems that are customized to the needed requirements of a company or group is an essential part of designing input, output, and user interface designs. We'll look at how to convert the functional requirements into user interface designs in this section.

### 5.1 Class Diagram

Class diagram is diagram for illustrating the database in an object-oriented manner, fully embracing the capabilities and restrictions of object-oriented models, highlighting the four main characteristics abstraction, inheritance, polymorphism, and lastly encapsulation. It contains the following components:

Classes are key entities of the class diagram, and they could physically be implemented as the database's collections or tables. Every class has three main sections:

**Attributes:** characteristics that make the object of a class unique when put together, every attribute has a sign behind it to show the visibility of the attribute. A plus (+) for public attributes, minus (-) for private attributes, and hash () for protected attributes in abstract classes that get inherited by other classes. And finally, the data type of the attribute is shown by writing the type after colons (:) next to the attribute's name.

**Functions:** the possible functionalities of an instance object from a specific class and can be neglected if the class has no functions. Functions can also have the same way as the attribute of showing the visibility trait that the function has.

**Title:** the title of the class and it usually is a name that considers the given attributes and functions of the class and it's mostly represented by names that are taken from real life physical entities.

**Relations:** relations are not bound to one class, they are relationships connecting to two classes together, there are many types of relationships.we have user inheritance,composition and aggregation. You can specify each end of the relation in this form ("minimum".."maximum") you can represent the two values bu either an integer or a star (\*) for unknown number of instances.

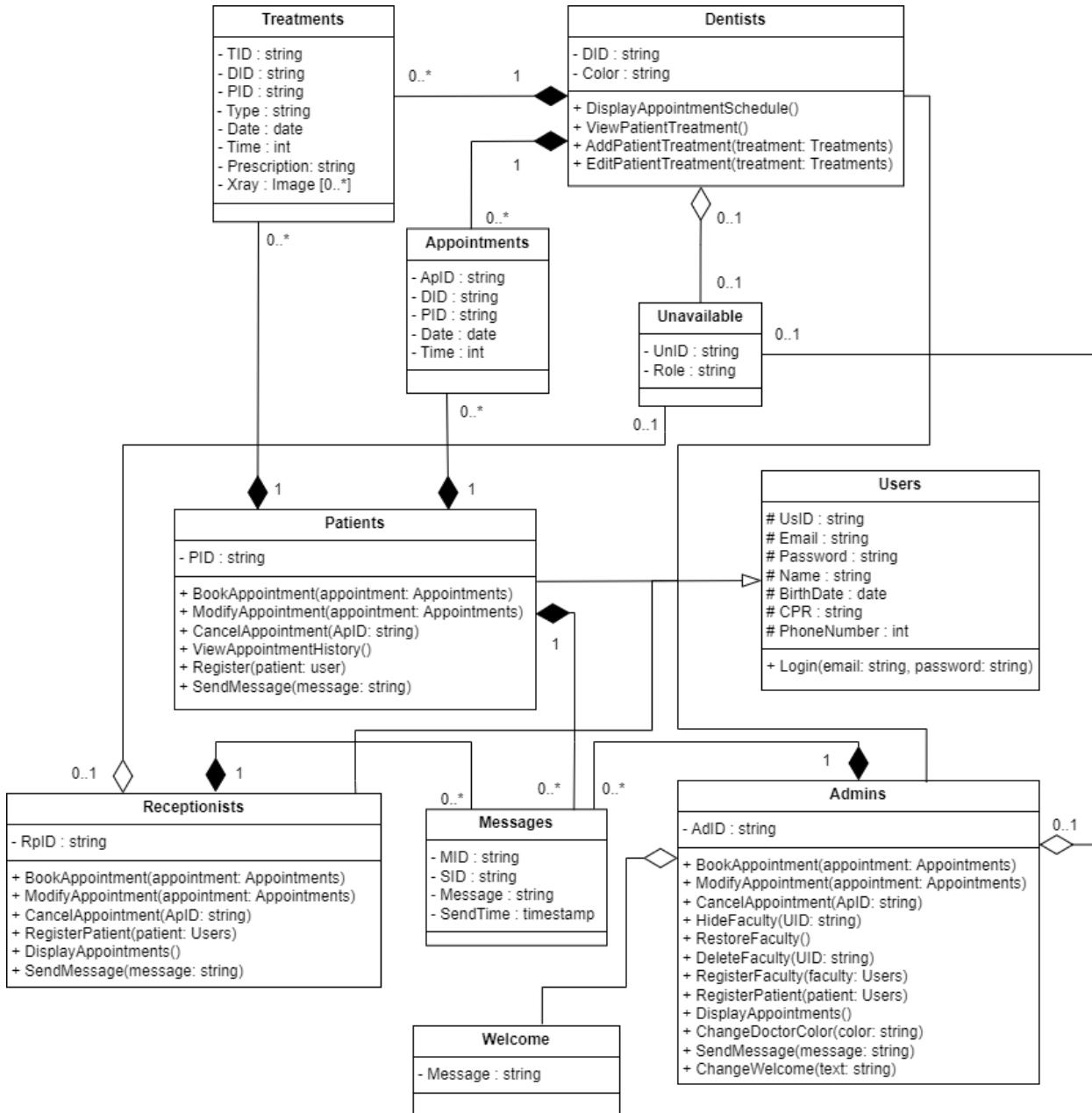


Figure 5.1: Class Diagram

Our class diagram is consisted of eight classes, the first class the **Users** class it is an abstract class that is inherited by all of the user classes in the database and it contains all of the attributes and the functions that are shared by all of the users and in this case only the login function is shared by all the users, and the shared attributes are User ID, Email, Password, Name, Birth Date, CPR, and Phone number. The next class is the **Administrator** class, and it's only attribute is the Administrator ID, while it only has one attribute it contains many functions. The third class is the **Receptionist** class is similar to The **Administrator** class but with less capabilities hence less functions. **Patients** class identified by the Patient ID attribute and it's capable of booking, modifying, and cancelling appointments generated by the object as well as viewing the appointments history booked by the object. There is **Dentist** class which has dentist id and it has the capability to create treatment and view appointments schedule.

## 5.2 User Interface Design

User interface design involves designing interfaces for different software applications and electronic devices. In order to design interfaces that users find simple and fun to use, this method places a high priority on features and styles.

### 5.2.1 Home Page

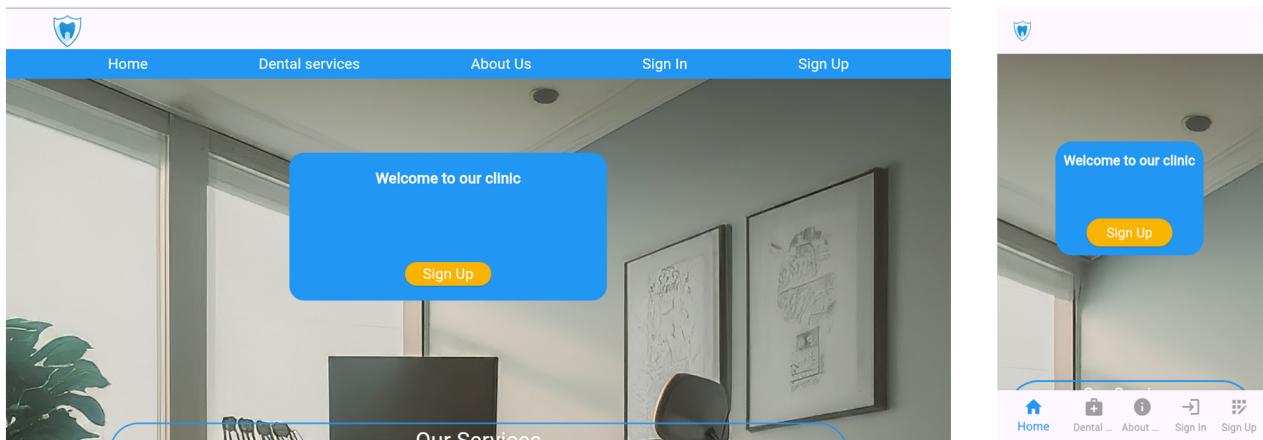


Figure 5.2: Home Page 1

On the home page, you will see a welcoming message and sign Up button. In the nav bar for both web and mobile it display the home , services , about us , sign in and sign up, we will explain what each button does.

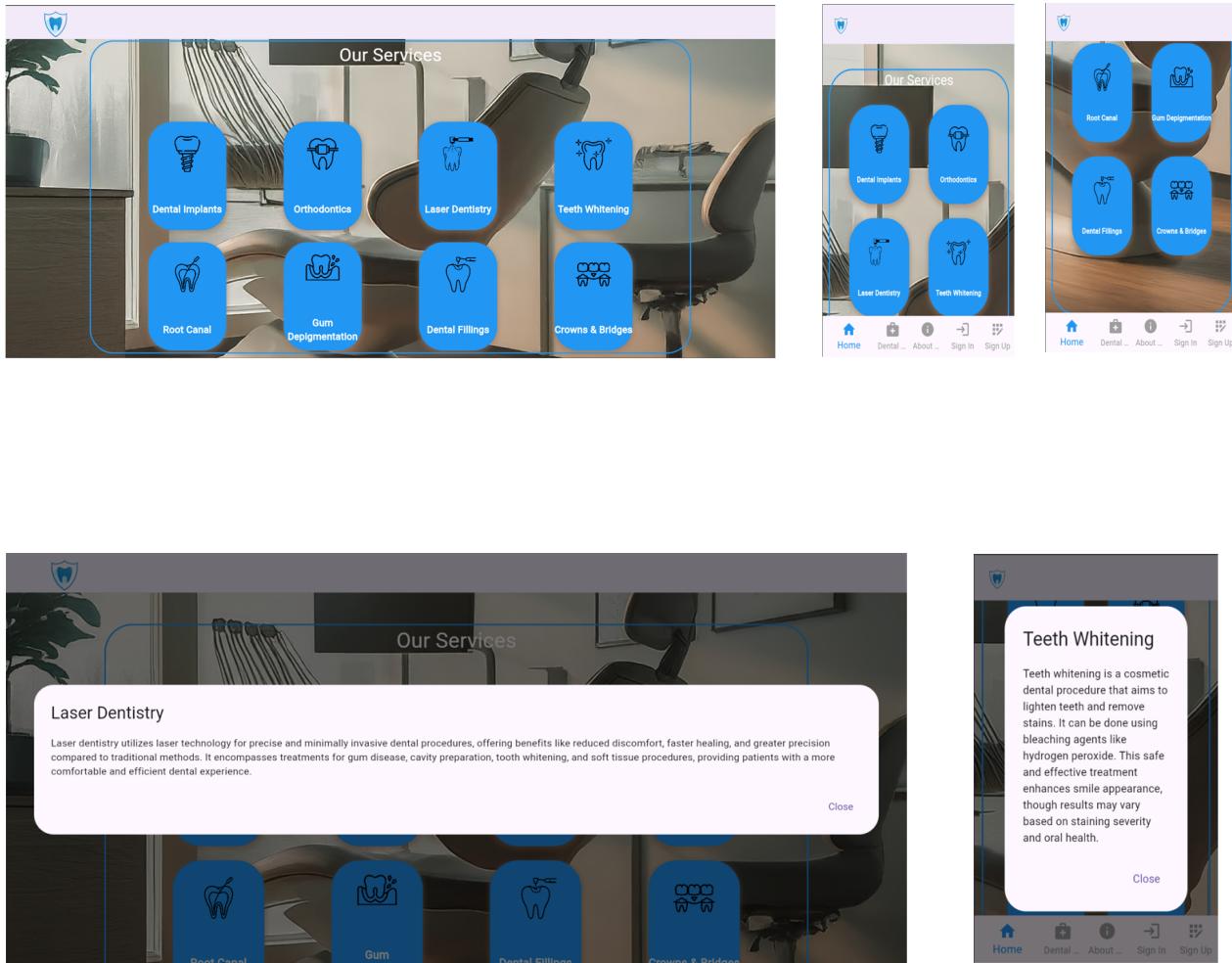


Figure 5.3: Home Page 2

Our services displays each service of the clinic that provide to the patient and when the user click on one of the services it is going to display the description of that service.

## 5.2.2 Services Page

Dental Services

Home Dental services About Us Sign In Sign Up

**Dental Implants**  
Dental implants are titanium tooth roots placed into the jawbone to support replacement teeth. They offer a durable and natural-looking solution for missing teeth, enhancing chewing, speech, and overall oral health.

**Orthodontics**  
Orthodontics is a dental specialty aimed at correcting misaligned teeth and jaws for improved oral health and aesthetics. Treatments involve braces or aligners to gradually align teeth and address issues like overcrowding and bite problems, enhancing both appearance and function.

**Laser Dentistry**  
Laser dentistry utilizes laser technology for precise and minimally invasive dental procedures, offering benefits like reduced discomfort, faster healing, and greater precision compared to traditional methods. It encompasses treatments for gum disease, cavity preparation, tooth whitening, and soft tissue procedures, providing patients with a more comfortable and efficient dental experience.

**Teeth Whitening**  
Teeth whitening is a cosmetic dental procedure that aims to lighten teeth and remove stains. It can be done using bleaching agents like hydrogen peroxide. This safe and effective treatment enhances smile appearance, though results may vary based on staining severity and oral health.

**Root Canal**  
A root canal is a dental procedure that addresses infected or damaged tooth pulp by removing the affected tissue, cleaning the inside of the tooth, and sealing it to prevent further infection. This treatment alleviates pain, preserves the tooth, and restores its function, often followed by the placement of a crown for added protection and strength.

Dental Services

Home Dental services About Us Sign In Sign Up

**Dental Implants**  
Dental implants are titanium tooth roots placed into the jawbone to support replacement teeth. They offer a durable and natural-looking solution for missing teeth, enhancing chewing, speech, and overall oral health.

**Orthodontics**  
Orthodontics is a dental specialty aimed at correcting misaligned teeth and jaws for improved oral health and aesthetics. Treatments involve braces or aligners to gradually align teeth and address

Home Dental Serv... About ... Sign In Sign Up

## 5.4 Services Page

In this page it displays every service that the clinic provide along with the description of the service.

## 5.2.3 About Us Page

About Us

Home Dental services About Us Sign In Sign Up

**Dr.Mansor Jasim**  
Welcome to Dr. Mansor Jasim, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Mansor Jasim for a dental experience that combines expertise and empathy.

**Dr.Fatima ali**  
Welcome to Dr. Fatima ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Fatima ali for a dental experience that combines expertise and empathy.

**Dr.Jaffar ali**  
Welcome to Dr. Jaffar ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Jaffar ali for a dental experience that combines expertise and empathy.

**Dr.Ali hasan ali**  
Welcome to Dr. Ali hasan ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Ali hasan ali for a dental experience that combines expertise and empathy.

**Dr.Ali Hadi Talib**  
Welcome to Dr. Ali Hadi Talib, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Ali Hadi Talib for a dental experience that combines expertise and empathy.

About Us

Dr.Mansor Jasim  
Welcome to Dr. Mansor Jasim, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Mansor Jasim for a dental experience that combines expertise and empathy.

Dr.Fatima ali  
Welcome to Dr. Fatima ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Fatima ali for a dental experience that combines expertise and empathy.

Home Dental ... About Us Sign In Sign Up

## 5.5 About Us Page

In This page it will display the all dentist in the clinic along with a description.

### 5.2.4 Login Page

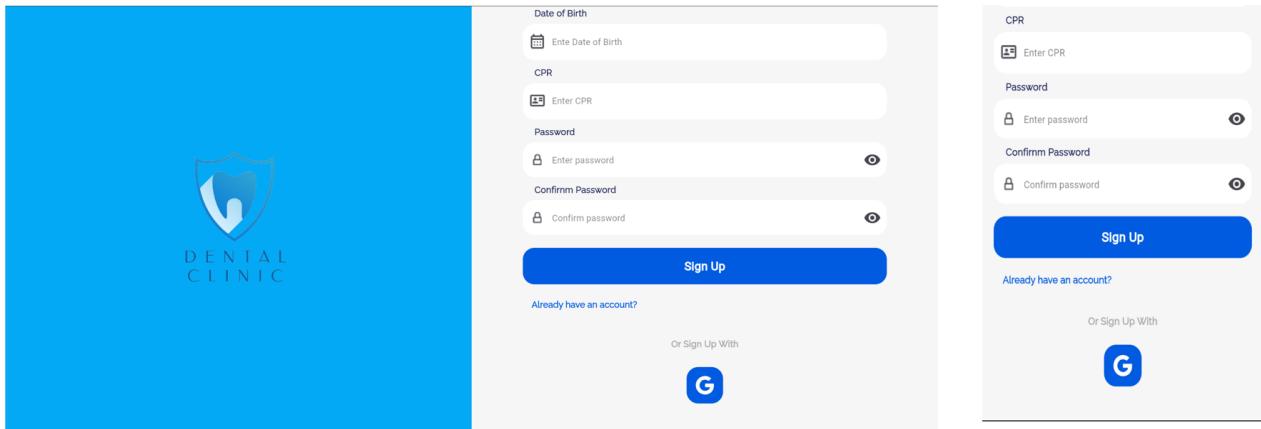
The image displays three variations of a login page. The first variation on the left includes a 'Forgot Password?' link and a 'Sign Up' link below the input fields. The second variation in the center is a simplified version of the first. The third variation on the right also includes a 'Forgot Password?' link and a 'Sign Up' link, but adds a 'Or Sign In With' section with a blue 'G' button, indicating a Google sign-in option.

### 5.6 Login Page

In the Login Page where all users should login using their email and password

### 5.2.5 Sign Up Page

The image shows a sign-up form. On the left is a blue sidebar with the 'DENTAL CLINIC' logo. The main form area has a 'Let's Sign Up' header with a placeholder 'Hey, Enter your details to create a new account.'. It contains fields for 'Email' (placeholder 'Enter email'), 'Full Name' (placeholder 'Enter Full Name'), 'Phone Number' (placeholder 'Enter Your phone number'), 'Gender' (radio buttons for 'Male' and 'Female' with 'Male' selected), and 'Date of Birth' (calendar icon placeholder 'Enter Date of Birth').

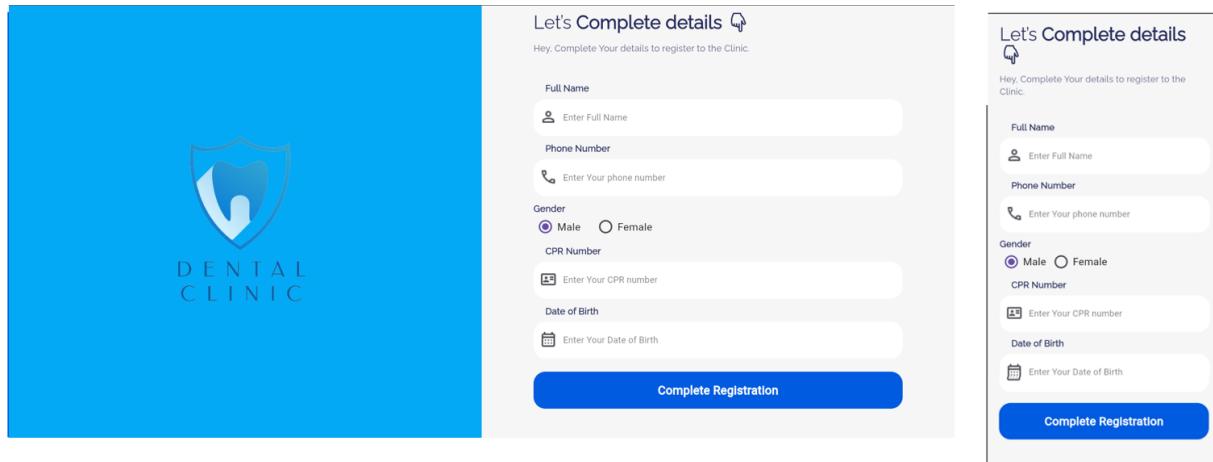


The sign up page is designed for patients to register. It features a blue header with the 'DENTAL CLINIC' logo. The main form area contains fields for Date of Birth, CPR, Password, and Confirm Password. A 'Sign Up' button is at the bottom, followed by links for 'Already have an account?' and 'Or Sign Up With' (Gmail).

Figure 5.7 Sign up Page

The sign Up page is exclusive for the Patients that they want to Sign Up to the system.

#### 5.2.6 Complete details Page



This page is for completing registration details. It includes fields for Full Name, Phone Number, Gender (Male/Female), CPR Number, and Date of Birth. A 'Complete Registration' button is at the bottom, and a note above it says 'Hey, Complete Your details to register to the Clinic.'

Figure 5.8 Complete details Page

This Page only displayed to the patient when the patient choose to sign Up using the gmail.

### 5.2.7 Reset Password Page

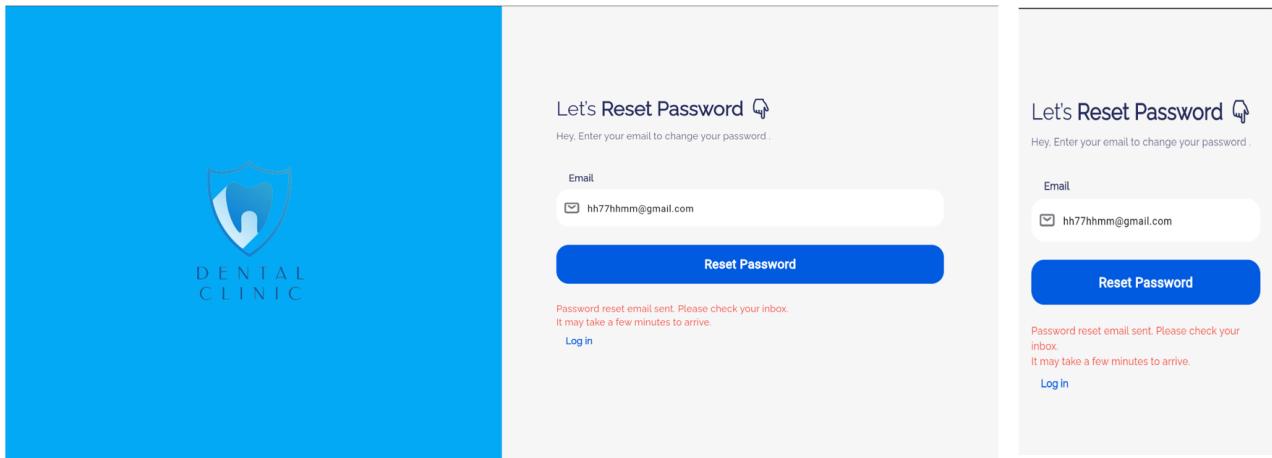


Figure 5.9 Reset Password Page

In this page the patient should input the email to send an email that reset the password and create a new password.

### 5.2.8 Patients Screens

#### 5.2.8.1 Patient Home Page

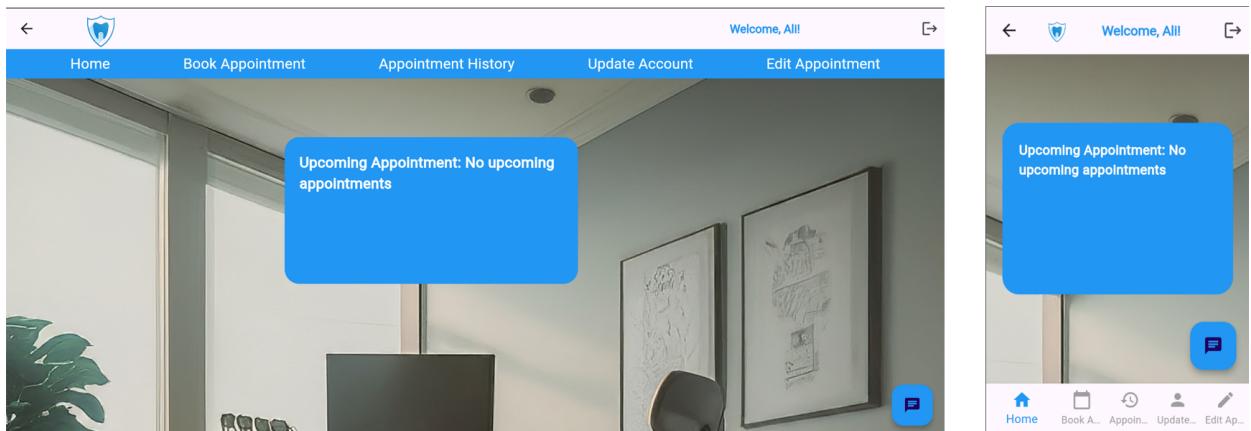


Figure 5.10 Patient Home Page

After the patient sign into the system it is going to display the first name of the user and the Upcoming appointment. It have also a Nav bar that displays the Home , Book Appointment , Appointment History, Update Account and Edit Appointment. Also it has a chat channel that the patient can chat with admin or reception.

### 5.2.8.2 Booking Page

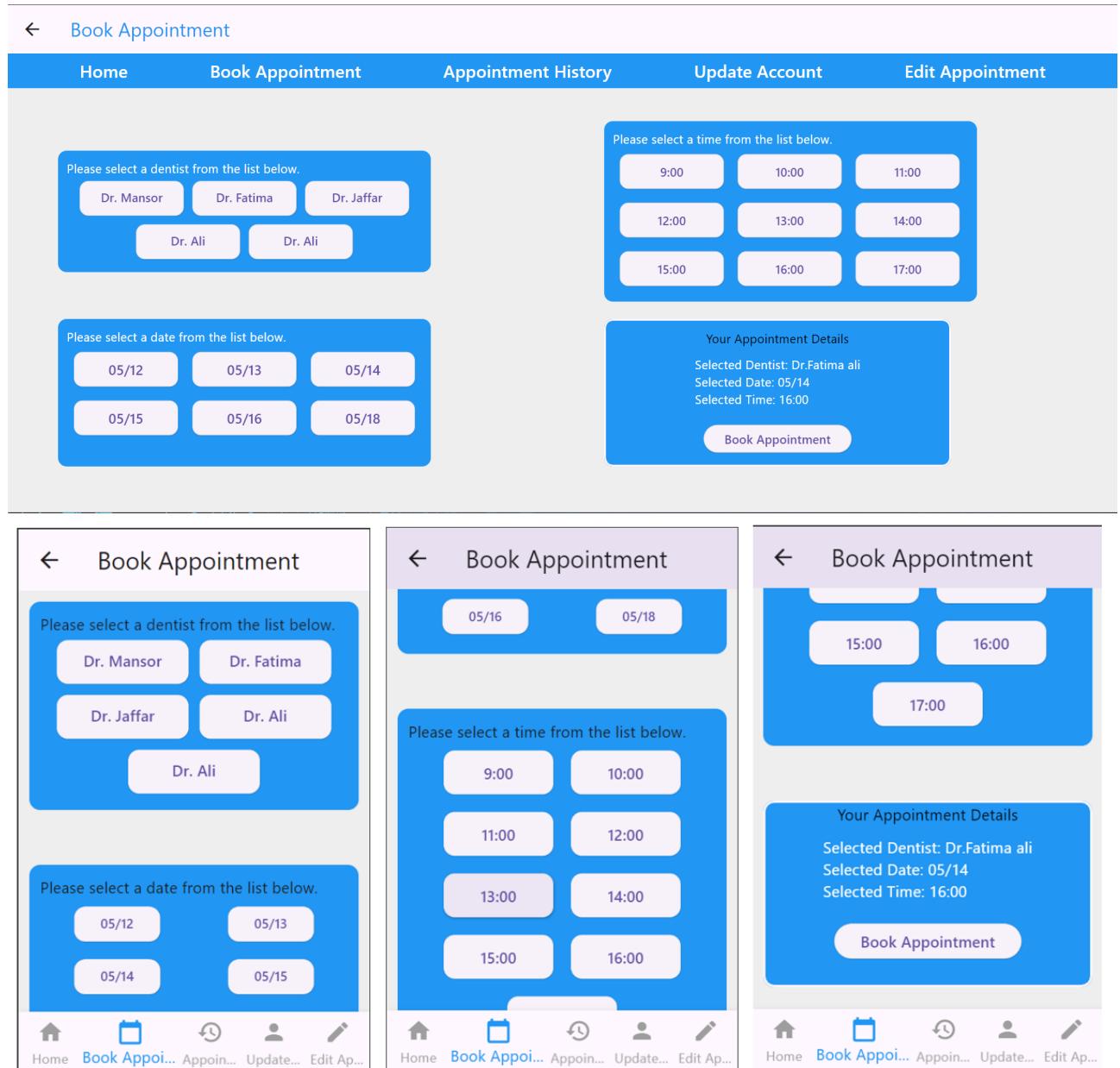


Figure 5.11 Booking Page

In the booking page the patient can choose the dentist , the date and the time. after that it will display the details of the booking and button book appointment.

### 5.2.8.3 Appointments History Page

The left screenshot displays a list of past appointments:

- Dentist: Dr.Ali Date: 2024-5-1 Time: 11:00
- Dentist: Dr.Fatima Date: 2024-5-6 Time: 12:00
- Dentist: Dr.Mansor Date: 2024-5-9 Time: 11:00

The right screenshot shows a similar list with a header row and a bottom navigation bar.

Figure 5.12 Appointments History Page

In this page it will display the appointment that have been booked before.

### 5.2.8.4 Update Account Page

The left screenshot shows a form with fields for:

- Full Name: All mohamed hasan
- CPR: 020705421
- Date of Birth: 28/07/2002
- Gender: Male (radio button selected)
- Phone Number: 34566543

The right screenshot shows a similar form with additional fields for:

- Full Name: All mohamed hasan
- CPR: 020705421
- Date of Birth: 28/07/2002
- Gender: Male (radio button selected)
- Phone Number: 34566543

Figure 5.13 Update Account Page

This page where the patient can update his/her details and displays a button that update the details.

### 5.2.8.6 Edit Appointment Page

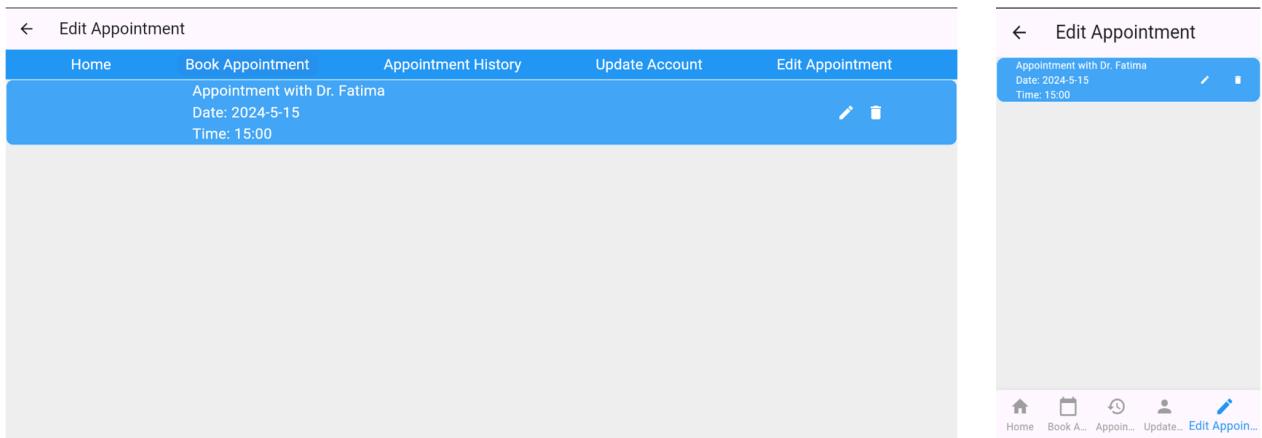


Figure 5.14 Edit Appointment Page

In This page the patient can either delete the appointment that is still did not pass its time or update the appointment which can lead it to Update Appointment Page.

### 5.2.8.7 Update Appointment Page

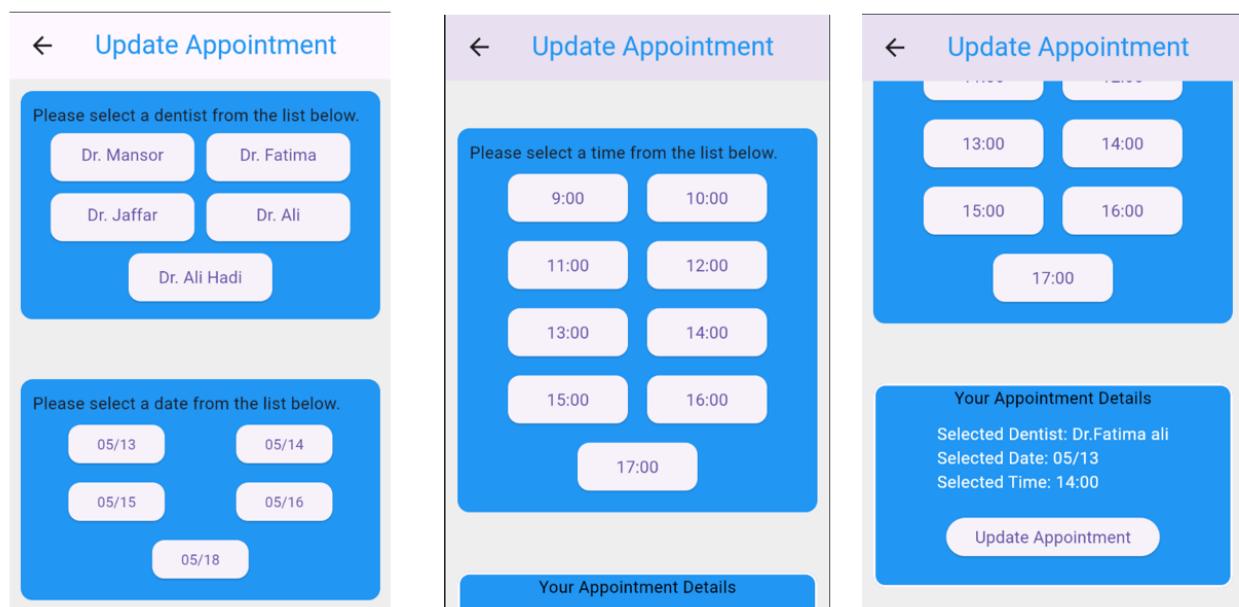


Figure 5.15 Update Appointment Page

A screen similar to the booking page will appear after the user selects to change the appointment, allowing the patient to make changes.

### 5.2.8.8 Chat page

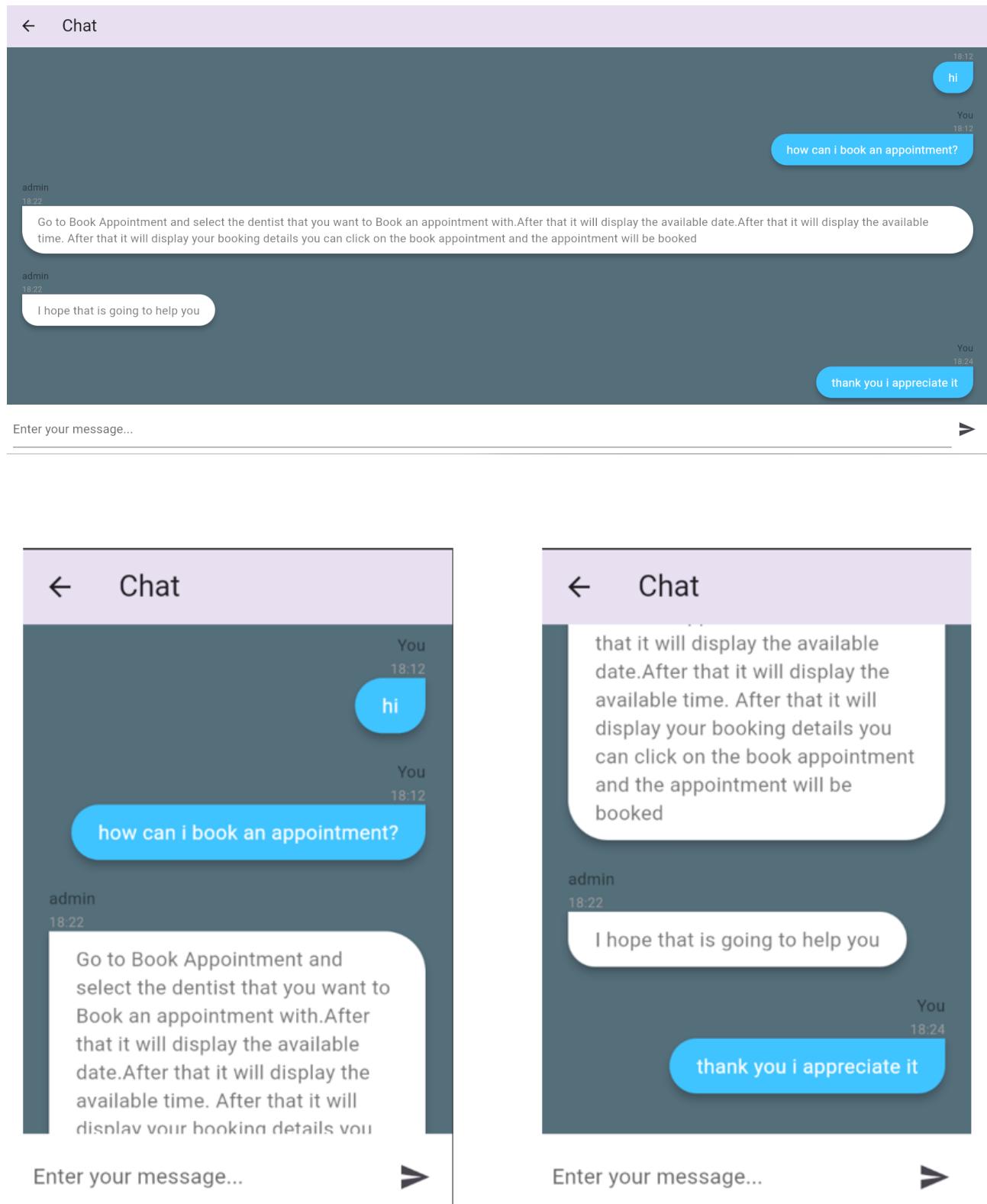


Figure 5.16 Chat Page

The patient may chat with the administrator or reception on this page about any connected to the system problem.

## 5.2.9 Admin Screens

### 5.2.9.1 Dashboard page

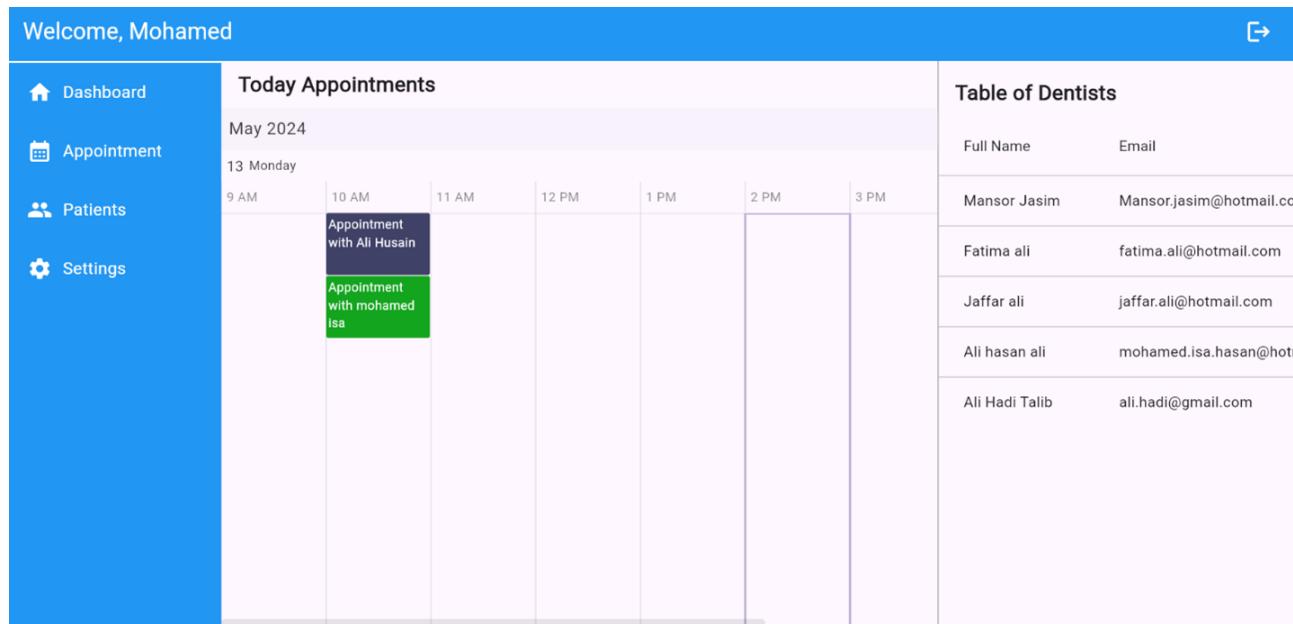


Figure 5.17 Dashboard Page

Upon login into the system, the administrator is automatically sent to the dashboard. The dashboard contains a full list of dentists who are currently in practice at the clinic, along with their contact information, which includes email addresses. It also has a calendar with the day's schedules shown on it, including dental appointments color-coded. The process of identifying busy periods is made easier with this organizational approach. In addition, a sidebar menu provides quick access to additional system features, such as the patient page and other pages. Regarding the header part, the administrator receives a personalized welcome message with their name when they log in to the system. Furthermore, an icon on right-hand side gives them the flexibility to log out of the system whenever they wish.

### 5.2.9.2 Appointments page

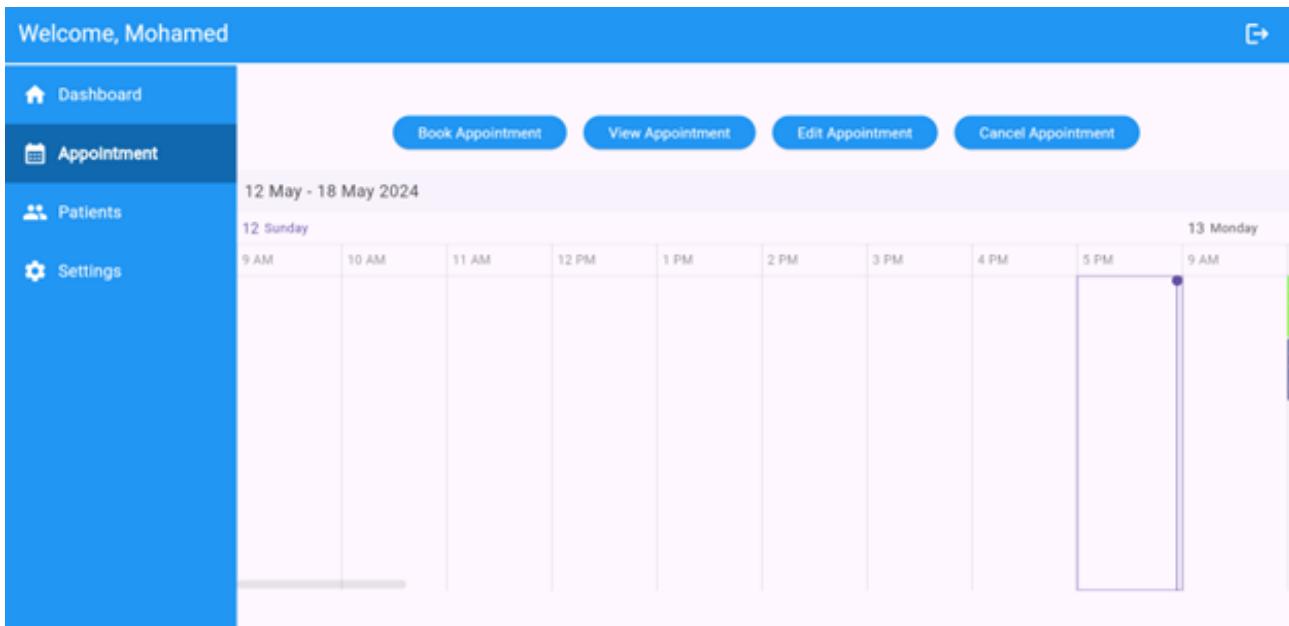


Figure 5.18 Appointments Page

There is a calendar on the appointment page that is fixed to this week, showing the appointment for this week. Four buttons—book appointment, view appointment, edit appointment, and cancel appointment—are displayed on this page. The clinic appointment schedule is accessible to the user through these buttons.

### 5.2.9.3 Admin Booking page

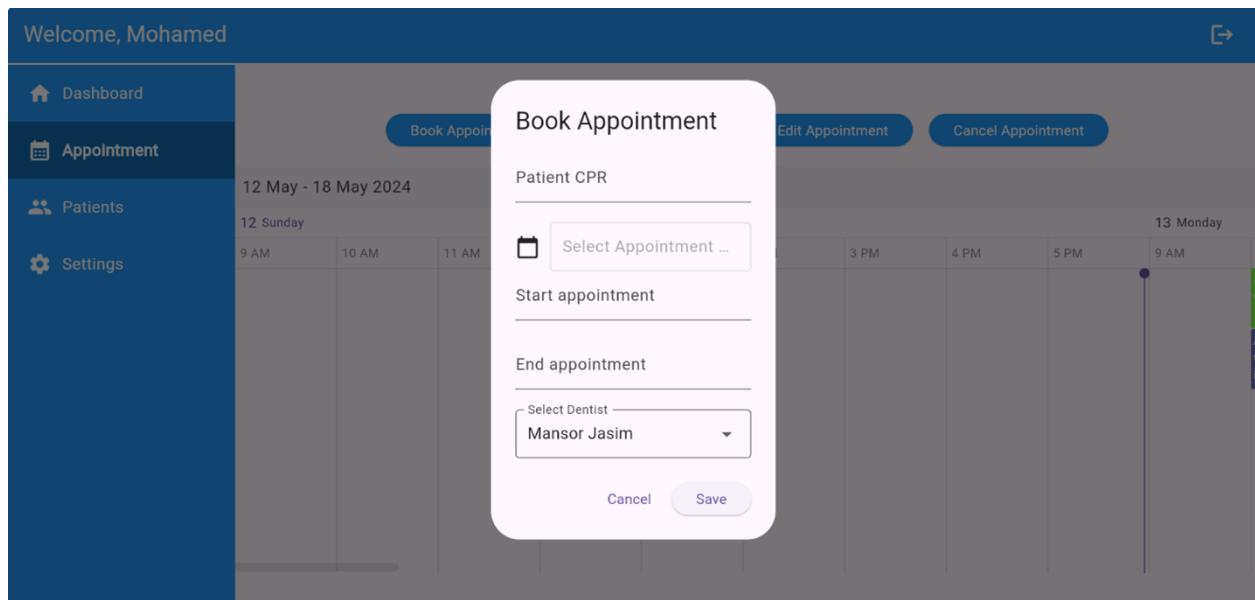


Figure 5.19 Admin Booking Page

When the "book appointment" button is clicked, a form requesting the patient's CPR, appointment date, start and end appointment, and dentist list will appear on the screen. If the CPR is found in the system, the appointment will be scheduled successfully; if it is not, a notification stating that a new patient must be added from the patients' page will be displayed. The user may simply choose a date for the appointment by seeing the calendar displayed by the system. Additionally, starting and ending appointments will allow the clinic greater flexibility in terms of defining the duration of the appointments. The appointment will then be scheduled by clicking the save button.

#### 5.2.9.4 View Appointment page

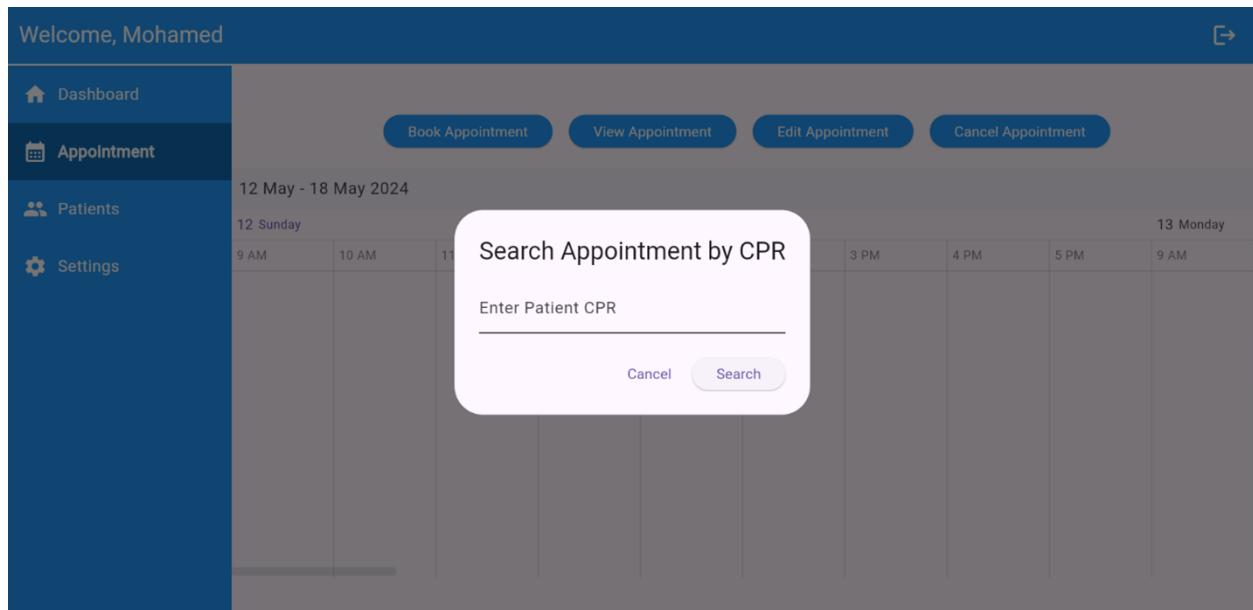


Figure 5.20 View Appointment Page

When a user clicks "view appointment," a form requesting CPR from the patient is displayed. The system then verifies that the CPR is in the database. When a user clicks "search," the system displays the patient's appointment; if the CPR is not found, an error notification is displayed.

### 5.2.9.5 Appointment Information page

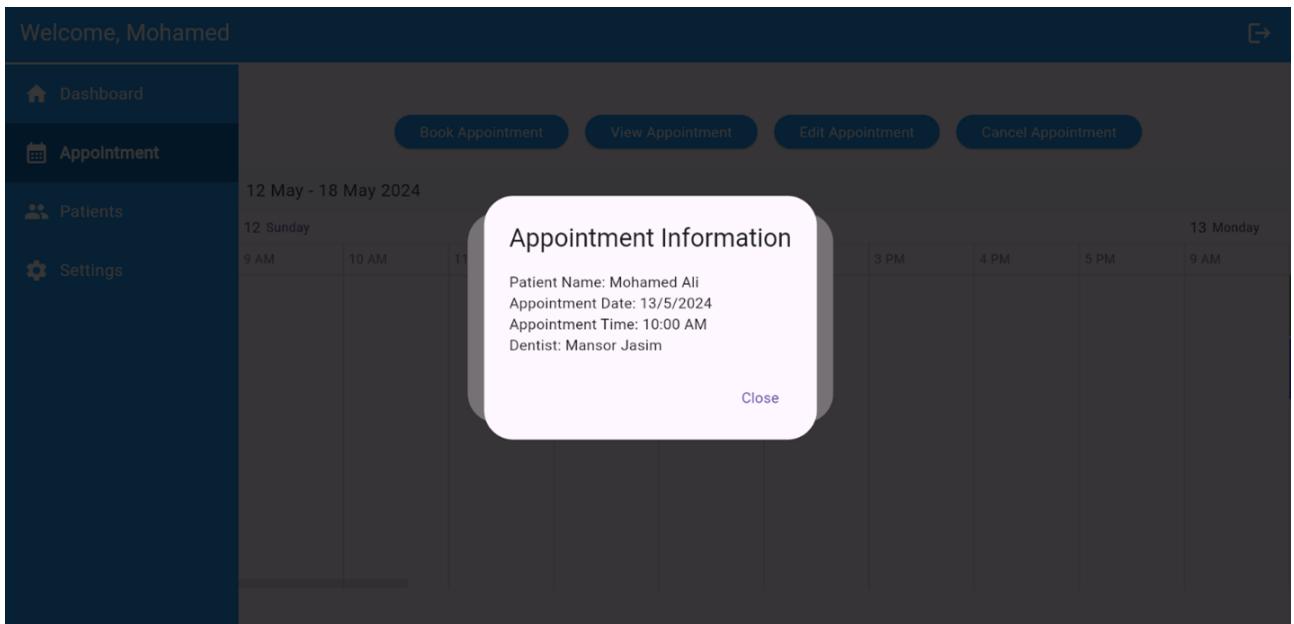


Figure 5.21 Appointment Information Page

If the CPR is found in database.

### 5.2.9.6 Admin Edit Appointment page

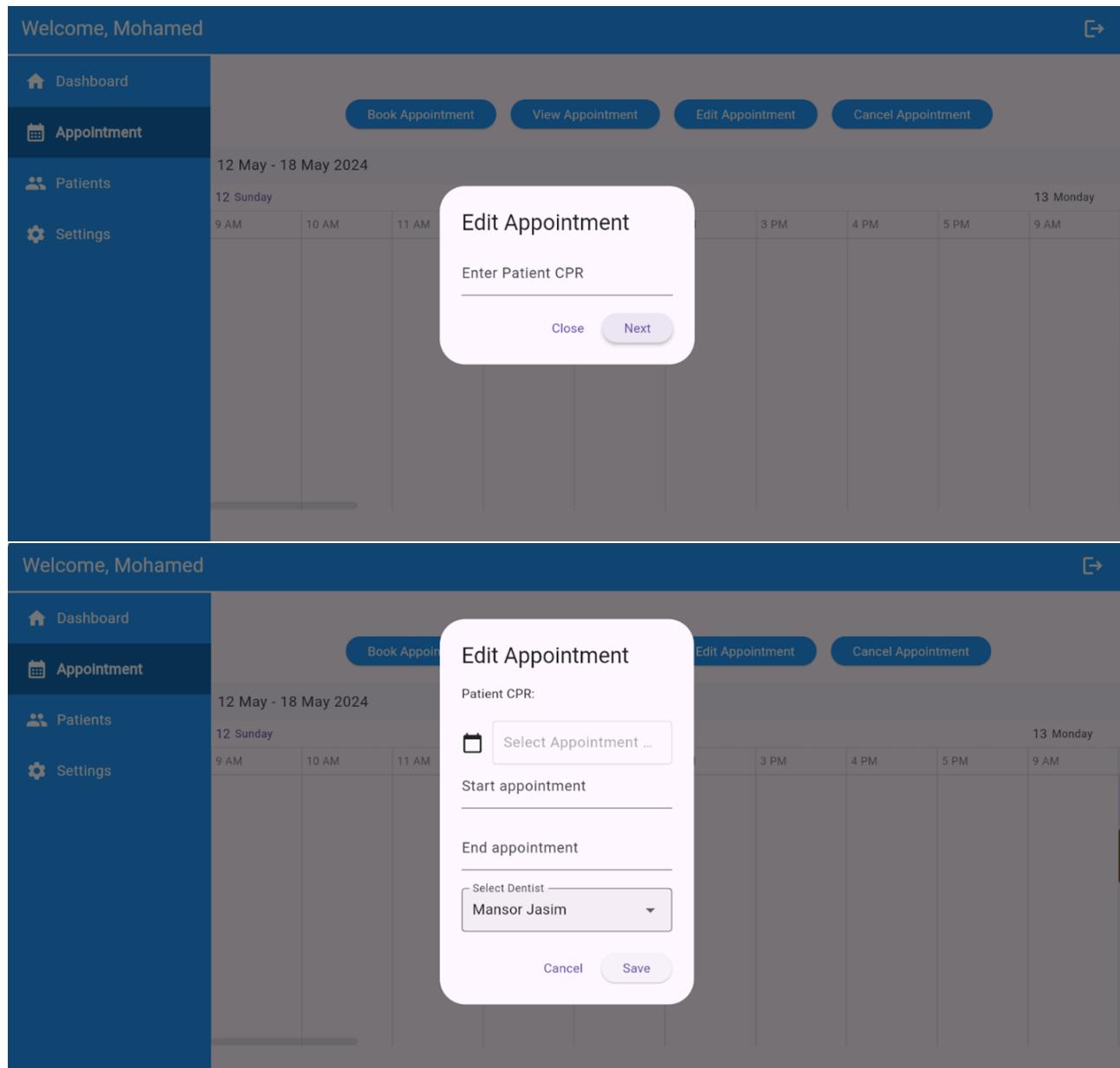


Figure 5.22 Appointment Information Page

When the user clicks on the "Edit Appointment" button, a form will pop up, prompting the user to enter the CPR (Civil Personal Record) number. Upon clicking "Next", the system will verify whether the patient has an existing appointment at our clinic. If the system confirms the patient's appointment, another form, similar to the appointment booking form, will be displayed. The key distinction is that in this edit form, the fields will be pre-filled with existing appointment details, allowing the user to edit them, except for the CPR field.

### 5.2.9.7 Cancel Appointment page

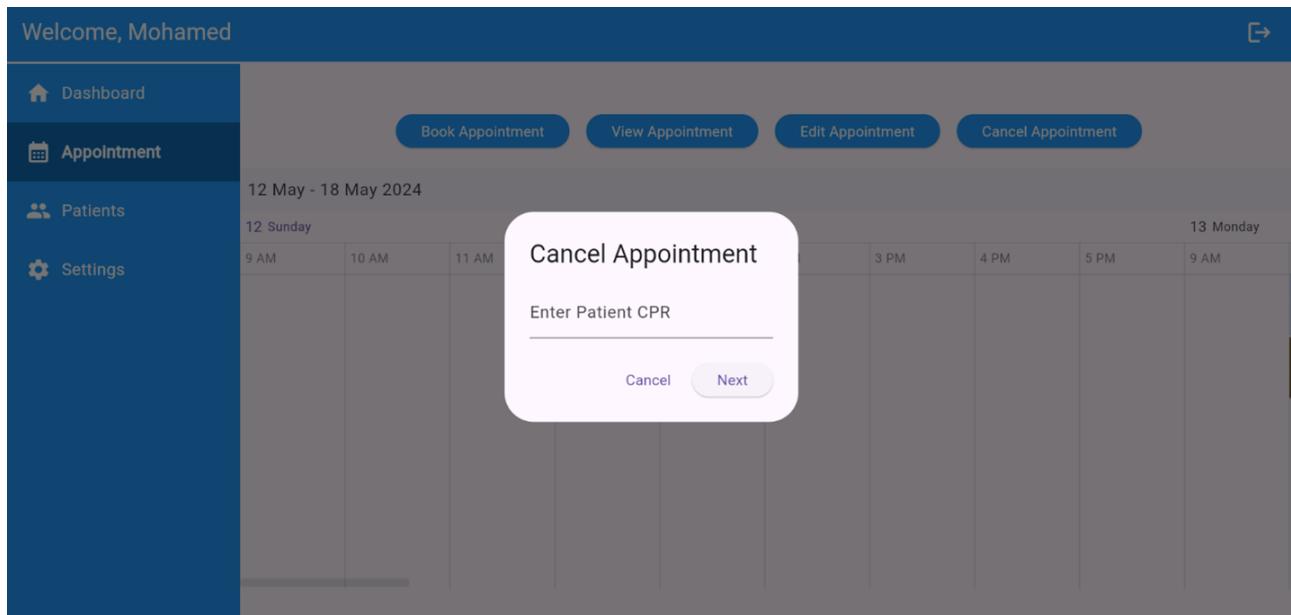


Figure 5.23 Cancel Appointment Page

When clicking cancel appointment buttons, the system will display form that take the patient CPR and the system will check and search for the appointment.

### 5.2.9.8 Confirm Cancel Appointment page

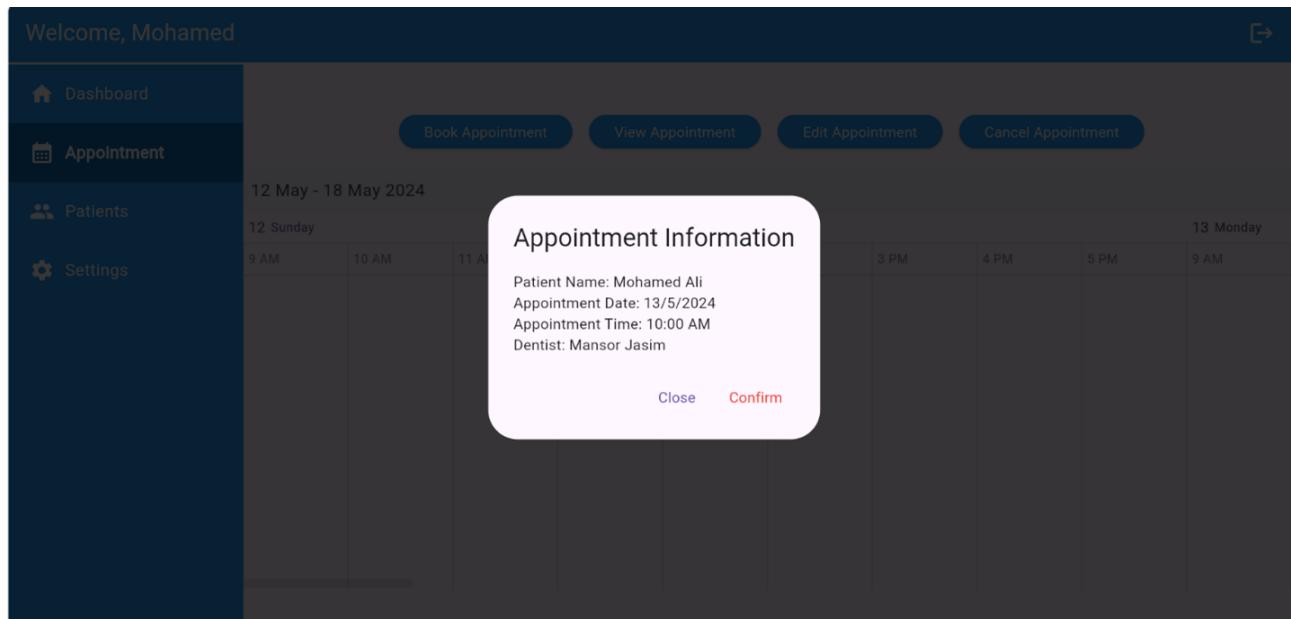


Figure 5.24 Confirm Cancel Appointment Page

The user will see the appointment details to fully confirm that this is the appointment that will be canceled. By selecting "Confirm," the appointment will be deleted.

### 5.2.9.9 Patient List page

The screenshot shows a mobile application interface for a clinic. At the top, a blue header bar displays "Welcome, Mohamed". On the right side of the header is a small icon with an arrow pointing right. Below the header is a vertical navigation menu on the left side, featuring five items with icons: "Dashboard" (home), "Appointment" (calendar), "Patients" (two people), "Settings" (gear), and "Logout" (represented by a right-pointing arrow). The main content area on the right lists six patients, each with a name and a corresponding CPR number. The first patient listed is "hasan ali" with CPR "011012920". The second patient is "Ali mohamed hasan" with CPR "020709773". The third patient is "mohamed isa hasan" with CPR "040203263". The fourth patient is "Mohamed isa hasan" with CPR "020709221". The fifth patient is "Ali Husain" with CPR "011012921". The sixth patient is partially visible. At the top right of the main content area are two blue buttons: "Add New Patient" and "Search".

Figure 5.25 Patient List Page

The patient page will open once you choose the "Patient" option from the side menu. This page lists all of the patients that are kept in the clinic database, along with their names and CPR. There are also two buttons accessible: one to search among current patients and the other to add a new patient.

### 5.2.9.10 Search Patient page

The screenshot shows the same mobile application interface as Figure 5.25, but with a search dialog box overlaid on the patient list. The search dialog has a title "Search Patient" and a text input field labeled "Enter CPR" containing the value "020709773". Below the input field are two buttons: "Cancel" on the left and "Search" on the right. The rest of the interface, including the navigation menu and the list of patients, is visible in a dimmed state behind the dialog.

Figure 5.26 Search Patient Page

When the user presses the search button, the system will prompt them to enter the patient's CPR. After the CPR is entered, the system will check if the CPR exists in the database and matches with a record in the patient table. If a match is found, the system will navigate the user to another page named "Patient Details."

#### 5.2.9.10 Patient Details page



Figure 5.27 Patient Details Page

This page can be accessed either by clicking on the patient from the table or by searching using the search button. On this page, the system retrieves the patient's information from the database and displays it. Additionally, there is a button at the bottom of the page that enables the user to send a message to the patient, facilitating communication and the building of a conversation between them.

### 5.2.9.11 Admin Chat page

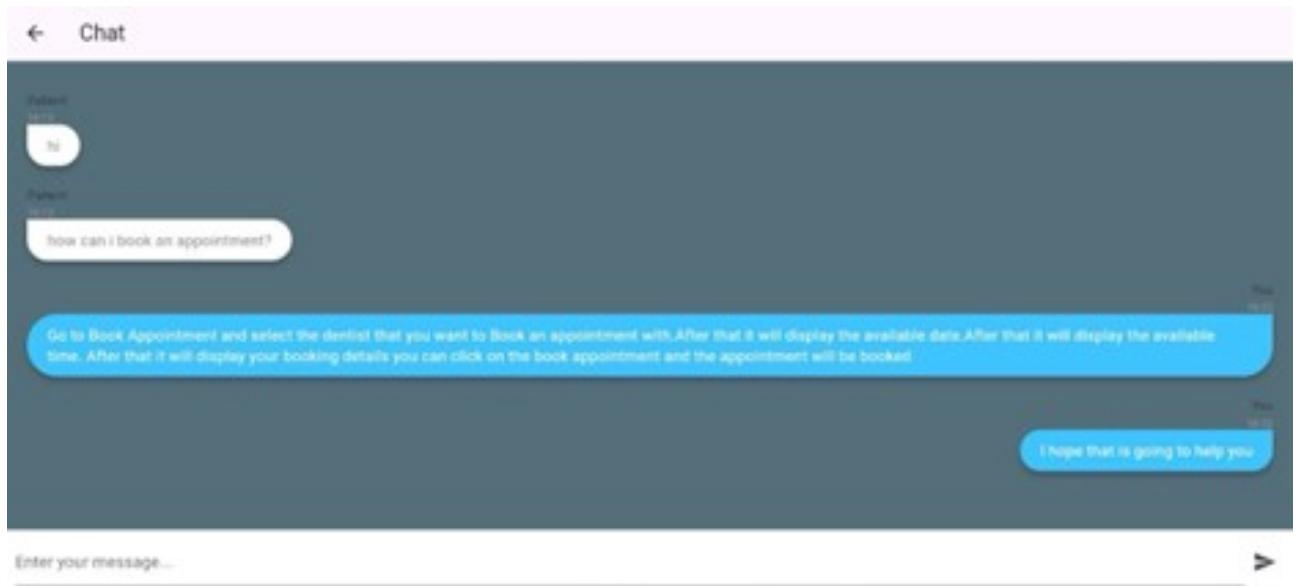


Figure 5.28 Admin Chat Page

When the user clicks on the button in the patient details page, the system will open a chat channel where the user can communicate with the patient easily.

### 5.2.9.12 Settings page

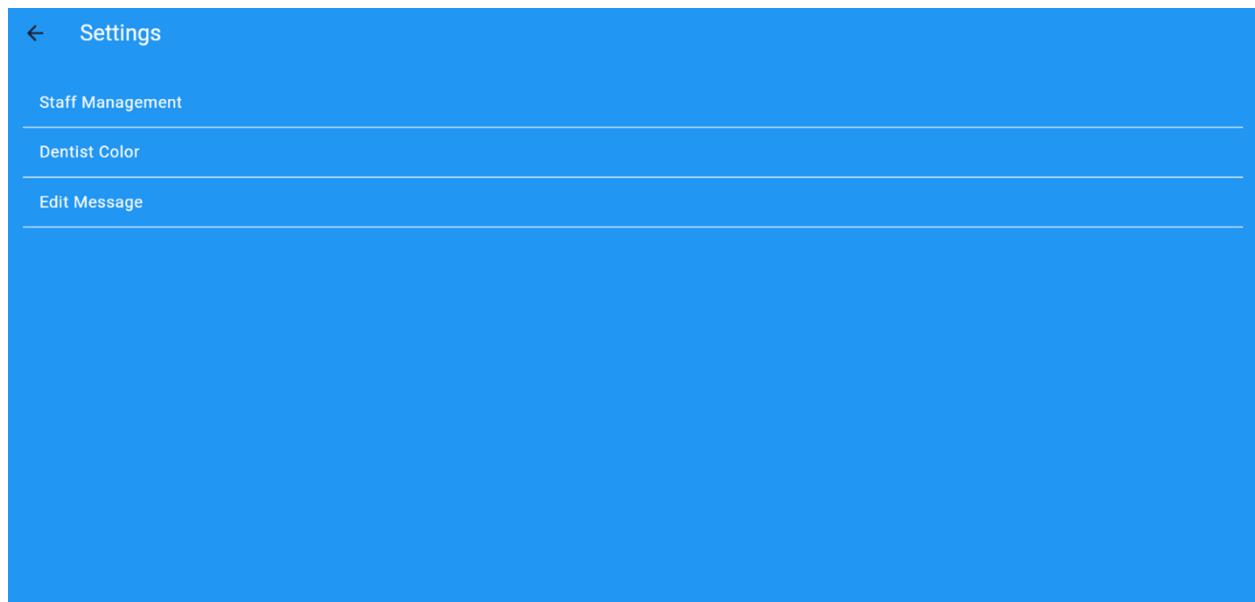


Figure 5.29 Settings Page

This page will appear whenever the user clicks on "Settings" in the side menu. Here, the user will have control over various aspects of the clinic. They can easily modify the welcome message on the home page, manage staff, and assign colors to dentists to differentiate them in the calendar.

### 5.2.9.13 Staff List page

← Staff Management	
Mansor Jasim Mansor.jasim@hotmail.com Dentist	trash
Mohamed isa hasan mohamed.isa.has.s@hotmail.com Admin	trash
Fatima ali fatima.ali@hotmail.com Dentist	trash
Jaffar ali jaffar.ali@hotmail.com Dentist	trash
Ali hasan ali mohamed.isa.hasan@hotmail.com Dentist	trash
Ali Hadi Talib ali.hadi@gmail.com Dentist	trash
	+

Figure 5.30 Staff List Page

After the user clicks on "Staff Management," this page will appear. The system will display a table containing staff information such as names, email addresses, and their roles in the clinic. The user can delete staff from the system by clicking on the trash icon, and they can also add new staff by clicking on the addition icon.

### 5.2.9.14 Add Staff page

← Staff Management	
Mansor Jasim Mansor.jasim@hotmail.com Dentist	trash
Mohamed isa hasan mohamed.isa.has.s@hotmail.com Admin	trash
Fatima ali fatima.ali@hotmail.com Dentist	trash
Jaffar ali jaffar.ali@hotmail.com Dentist	trash
Ali hasan ali mohamed.isa.hasan@hotmail.com Dentist	trash
Ali Hadi Talib ali.hadi@gmail.com Dentist	trash
	+

#### Add Staff Member

Full Name

CPR

Email

Phone Number

Birthday

Gender  
 Male  
 Female

Role  
 Admin  
 Dentist

Figure 5.31 Staff List Page

After the user clicks the addition icon on the Staff Management page, the system will display a form to gather information about the staff and add it to the database and system.

The form will prompt the user to enter the staff's name, CPR, email, phone number, birthday, and select gender. Additionally, the user will choose the staff's role in the clinic from a drop-down menu.

#### 5.2.9.15 Dentist Color Setting page

A screenshot of a web-based application interface titled "Dentist Color Settings". At the top left is a back arrow icon and the text "Dentist Color Settings". In the center is a title "Table of Dentists". Below the title is a table with five rows, each representing a dentist. The columns are "Full Name", "Email", and "Color". The "Color" column contains a dropdown menu with the option "Red" selected. At the bottom right of the table area are two buttons: "Cancel" and "Update".

Full Name	Email	Color
Mansor Jasim	Mansor.jasim@hotmail.com	Red ▾
Fatima ali	fatima.ali@hotmail.com	Red ▾
Jaffar ali	jaffar.ali@hotmail.com	Red ▾
Ali hasan ali	mohamed.isa.hasan@hotmail.com	Red ▾
Ali Hadi Talib	ali.hadi@gmail.com	Red ▾

Figure 5.32 Dentist Color Setting page

From the settings page, the user can access this page by clicking on "Dentist Color Settings." The primary purpose of this page is to give the user control over the colors displayed in the calendars. The system will display a table of dentists containing their names, emails, and a dropdown menu that allows the user to change the colors associated with each dentist. By clicking the update button, the database will update.

#### 5.2.9.16 Edit Welcome Message page

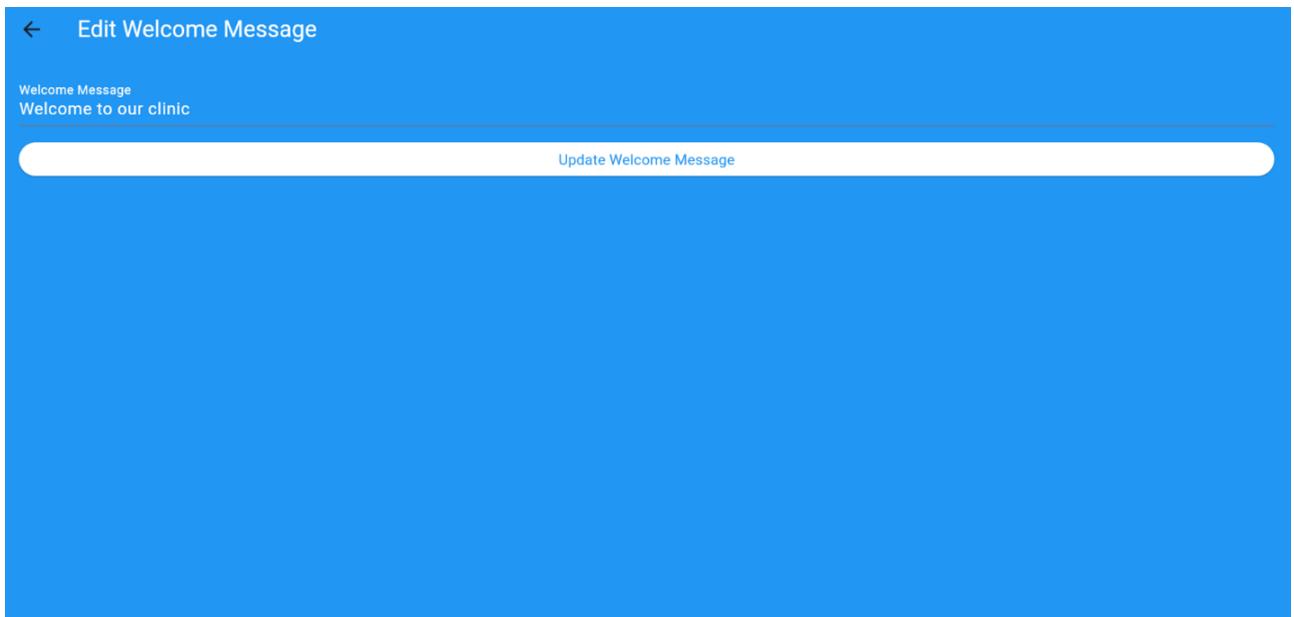


Figure 5.33 Edit Welcome Message page

To access this page, the user clicks on "Edit Welcome Message" from the settings. It contains a text field where the user can enter a new message or modify the existing one. By clicking the button at the bottom of the text field, the message will be updated in the database. When the user navigates to the home page, the welcome message will reflect the changes made by the user.s

## 5.2.10 Dentist Screens

### 5.2.10.1 Dentist Home Page

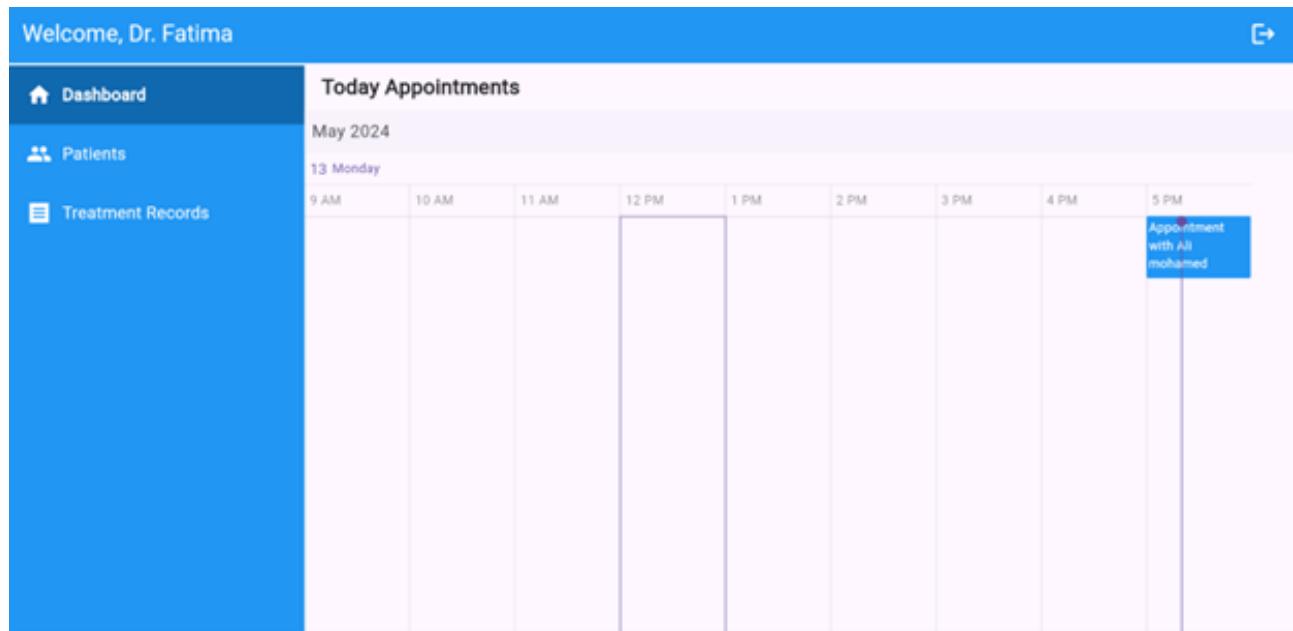


Figure 5.34 Dentist Home Page

When the dentist logs into the system, they will be directed to the default page, where a calendar showcasing their appointments for the day is prominently displayed. Each appointment will be represented as a card, colored blue for easy identification.

### 5.2.10.2 Patient List Page

The screenshot shows a web application interface for a dental practice. At the top, a blue header bar displays "Welcome, Dr. Fatima" on the left and a share icon on the right. Below the header is a sidebar with three main menu items: "Dashboard" (with a house icon), "Patients" (with a people icon), and "Treatment Records" (with a list icon). The "Treatment Records" item is currently selected, indicated by a darker blue background. The main content area to the right lists five patient entries, each consisting of a name and a unique ID. A search bar is located at the top right of the content area. The patients listed are:

Name	ID
hasan ali	011012920
Ali mohamed hasan	020709773
mohamed isa hasan	040203263
Mohamed isa hasan	020709221
Ali Husain	011012921

Figure 5.35 Patient List Page

The dentist can access patient information similarly to the admin and receptionist but with restricted access to their interfaces. The dentist cannot add new patients but can only search for existing ones.

### 5.2.10.3 Treatment Record Page

The screenshot shows a web application interface for a dental practice. At the top, a blue header bar displays "Welcome, Dr. Fatima" on the left and a share icon on the right. Below the header is a sidebar with three main menu items: "Dashboard" (with a house icon), "Patients" (with a people icon), and "Treatment Records" (with a list icon). The "Treatment Records" item is currently selected, indicated by a darker blue background. The main content area to the right lists a single treatment record, which includes the name of the procedure, the date it was performed, and the patient's ID. There is also a pen icon next to the record, likely for editing. An addition icon (+) is located in the top right corner of the content area. The treatment record listed is:

Treatment	Date	ID
Tooth Extraction	2024-04-27	020709773

Figure 5.36 Treatment Record Page

When the user clicks on "Treatment" in the side menu, a page will be displayed showing a list of treatment records. Each record will have a pen icon, allowing the user to edit it, and there will be an addition icon for adding new records.

#### 5.2.10.4 Treatment Record Details Page

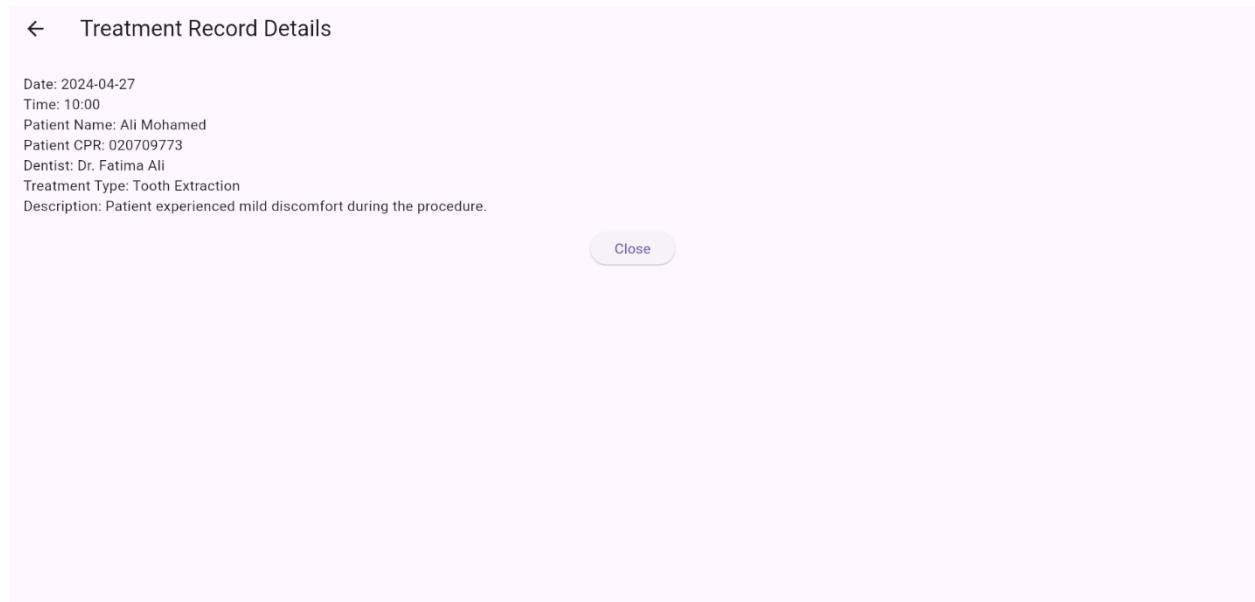


Figure 5.37 Treatment Record Details Page

When the user clicks on a treatment record, this page will be displayed, showing the details of the treatment record.

#### 5.2.10.5 Edit Treatment Record Page

A screenshot of a mobile application interface titled "Edit Treatment Record". At the top left is a back arrow icon and the text "Edit Treatment Record". Below this are input fields for the following information: Date (2024-04-27), Time (10:00), Patient Name (Ali Mohamed), Patient CPR (020709773), Dentist (Dr. Fatima Ali), Treatment Type (Tooth Extraction), and Description (Patient experienced mild discomfort during the procedure). There is also a section labeled "Attachments". At the bottom right is a "Save Changes" button.

Figure 5.38 Edit Treatment Record Page

When the user clicks on the pen icon, they can easily modify the treatment record.

### 5.2.10.6 Create Treatment Record Page

← Add Treatment Record

Date  
2024-05-13

Time  
17:21

Patient Name

Patient CPR

Dentist  
Dr. Fatima

Treatment Type

Description

Attachments

Cancel Add

Figure 5.39 Create Treatment Record Page

When the user clicks on the addition icon, the system will display the user's name and the current time. The user can then enter the treatment details and attach documents such as X-rays and other important information that should be stored in the clinic database for reference.

## 5.2.11 Receptionist Screens

### 5.2.11.1 Receptionist Home Page

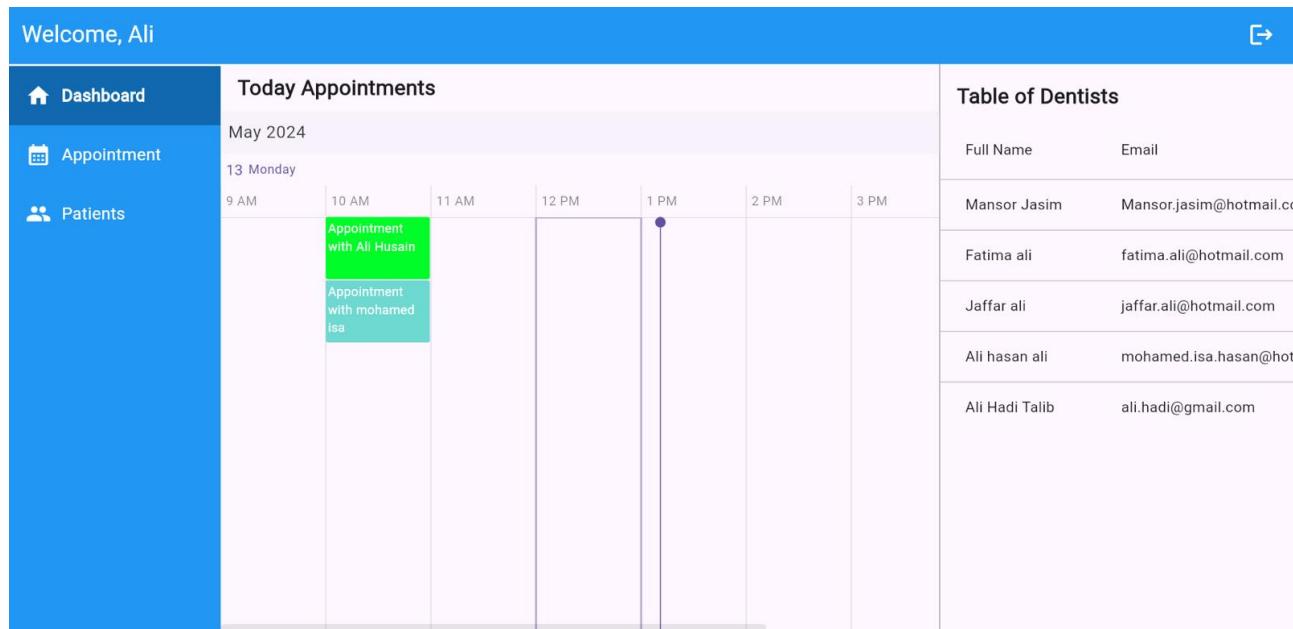


Figure 5.40 Receptionist Home Page

After login into the system, the receptionist is directed directly to the Home Page. The dashboard has a complete list of all the dentists who are currently in practice at the clinic, along with their email addresses. It also has a calendar with the appointments for the current day shown, including dental appointments that are color-coded. Determining peak hours is made easier with the help of this organizational method. A sidebar menu also provides quick access to other system components, such the patient page and other pages.

### 5.2.11.2 Appointments Page

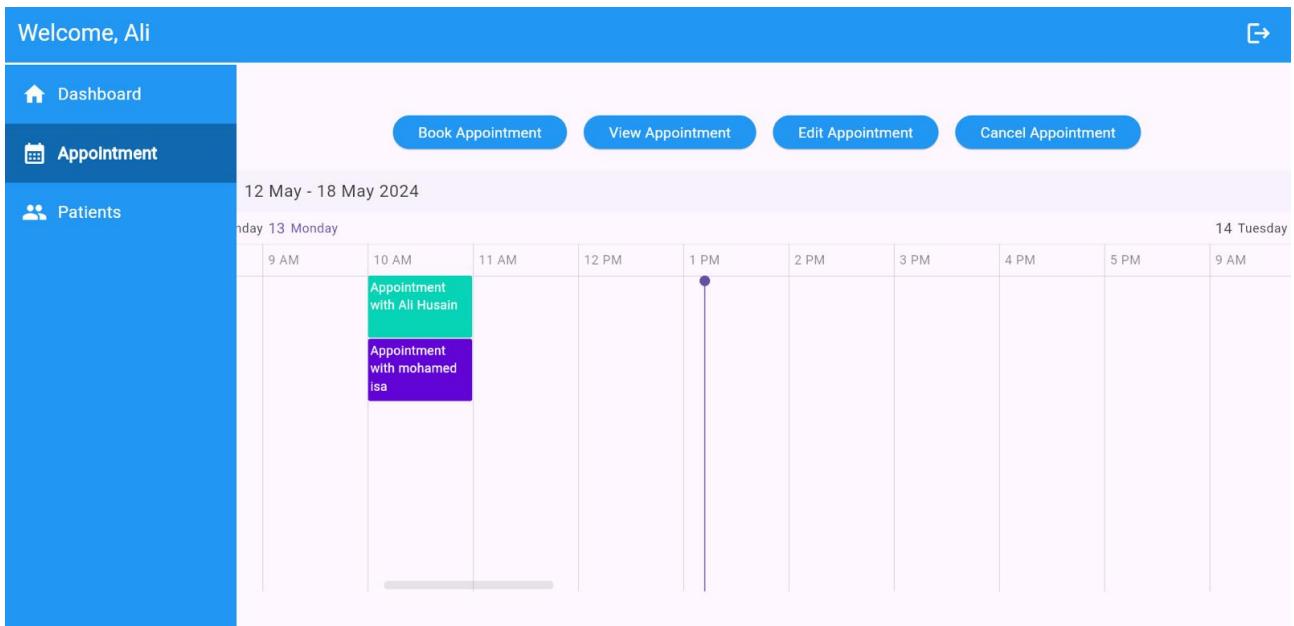


Figure 5.41 Appointments Page

Similar to the admin page, the appointment page has a calendar that is set to the current week and shows appointments for that time range. The receptionist has simple access to the clinic's appointment scheduling and administration features with the four buttons—book appointment, view appointment, edit appointment, and cancel appointment—prominently displayed on this page.

### 5.2.11.3 Patients List Page

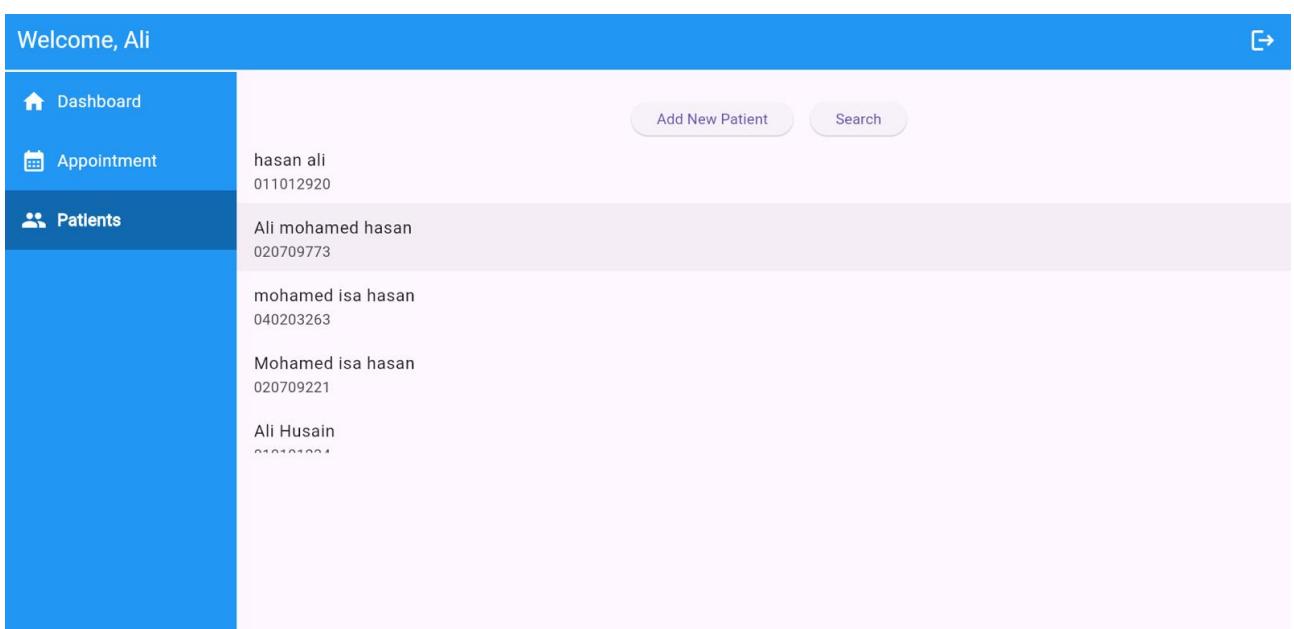


Figure 5.42 Patient List Page

The patient page will open when the receptionist chooses the "Patient" option from the side menu, just like the admin page. All of the patients listed on this page, along with their names and CPR numbers, are kept in the clinic database. Two more options are available: one to search among the patients who are currently on the list, and another to add new patients.

# Chapter 6

## System Implementation and Testing

In this chapter, we will go over the specifics of our implementation as well as the technologies and tools we used for this project. We will also use integration testing to check whether our project satisfies the technical requirements; this will involve comparing our system's behavior to what the customer had anticipated from this project. To provide our project to the customer in the best possible condition, testing is essential and required for any system to find and fix bugs.

### 6.1 Tools and languages use

Like other modern projects, our system was created using a wide range of tools and languages, and we will go over each one in detail below. We used certain variety tools, which include hardware like mobile devices with different operating systems and cloud services, to create this system.

#### 6.1.1 Compatible Platforms

We must make sure that our app is compatible with online applications as well as mobile operating systems like iOS and Android in order to develop it to be portable and accessible across several platforms. Even while iOS offers special features that are only available within its closed ecosystem, getting approved for the Apple Store might be difficult. On the other hand, because Android is open-source, developers have more freedom when it comes to releasing their apps. We may increase accessibility by taking into account compatibility with web apps. This will enable people to interact with our project through web browsers without difficulty, regardless of their device or operating system, improving overall usability and reaching a wider audience.

#### 6.1.2 Cloud Services

As our project is Cloud Based System also, we will use cloud architecture, so we need a good cloud service that meets our requirements we found that we need to utilize the following:

1. Google cloud: Businesses can run code without managing servers thanks to serverless computing services from Google Cloud Platform, like Cloud Functions and Cloud Run. Developers can now concentrate on developing code instead of managing infrastructure, which speeds up development cycles and lowers overhead.

### **6.1.3 Languages and database used**

1. Dart: is a programming language developed by Google that is mostly used with frameworks like Flutter to construct desktop, mobile, and online applications. Here are a few advantages of Dart usage: Google's Flutter Framework is a popular user interface toolkit. The majority of applications created with it are written in Dart. With Flutter, developers can create high-performing cross-platform apps that work on a range of platforms, such as desktop, web, iOS, and Android, all from a single codebase. Fast Development: Dart offers a just-in-time (JIT) compiler that makes it possible to quickly cycle between edits and refreshes while developing. This makes it possible for engineers to view changes to their code very rapidly, which speeds up the development process. Ahead-of-Time (AOT) Compilation: By compiling Dart before it is deployed in production, highly efficient native code can be generated. This ensures prompt.
2. Flutter: allows programmers to create code once and run it on multiple platforms, saving time and effort. Its hot reload functionality enables rapid development and allows for interactive and expressive user interfaces. Flutter's modular components allow for intricate designs without compromising functionality.
3. Firebase: provides strong authentication services and supports many authentication methods such as phone number authentication, social login (e.g., Google, Facebook, Twitter), and email/password. For developers, this streamlines the user administration and authentication procedures. Cloud Firestore: A scalable and adaptable database for server, web, and mobile development, Cloud Firestore is provided by Firebase. With features like automated scalability, offline data synchronization, and real-time updates, Firestore is appropriate for a variety of uses. Storage: Files, videos, and other user-generated information may be safely stored in the cloud with Firebase Storage. It makes managing user data and media assets easier by providing simple connectivity with Firebase Authentication and Firebase.

### **6.1.4 Others**

1. Draw.io: is a well-liked diagramming tool that is user-friendly and versatile due to its various features.
2. GitHub: is a popular website for hosting and collaborating on software projects due to its Git version control system, powerful tools for teamwork, and the ability to host both public and private repositories. It is suitable for both open-source and proprietary software development projects, with a subscription required for private repositories.
3. MS Project: All-inclusive Planning: It enables thorough project planning, which includes task definition, resource assignment, deadline setting, and dependency establishment.

## 6.2 Application Screens

### 6.2.1 Home Page

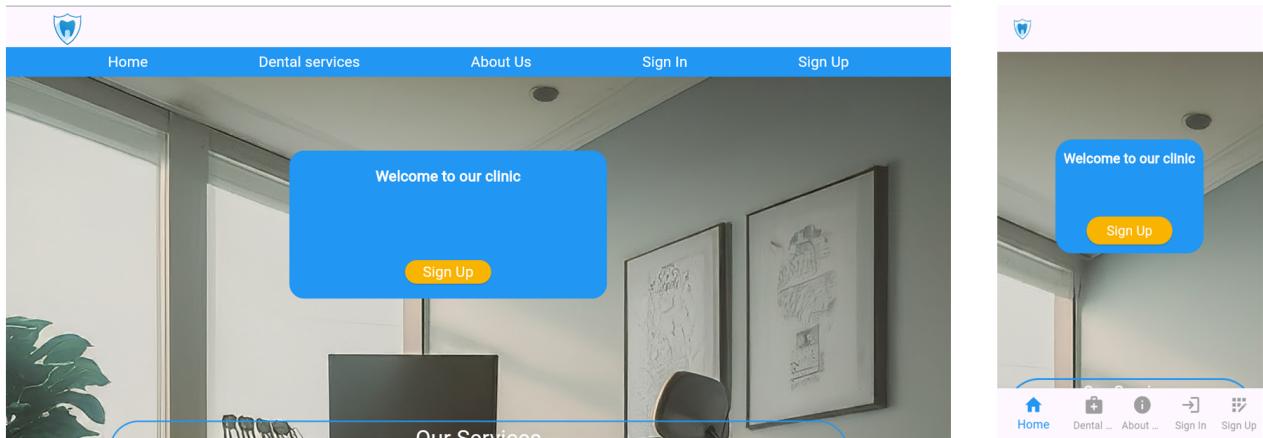
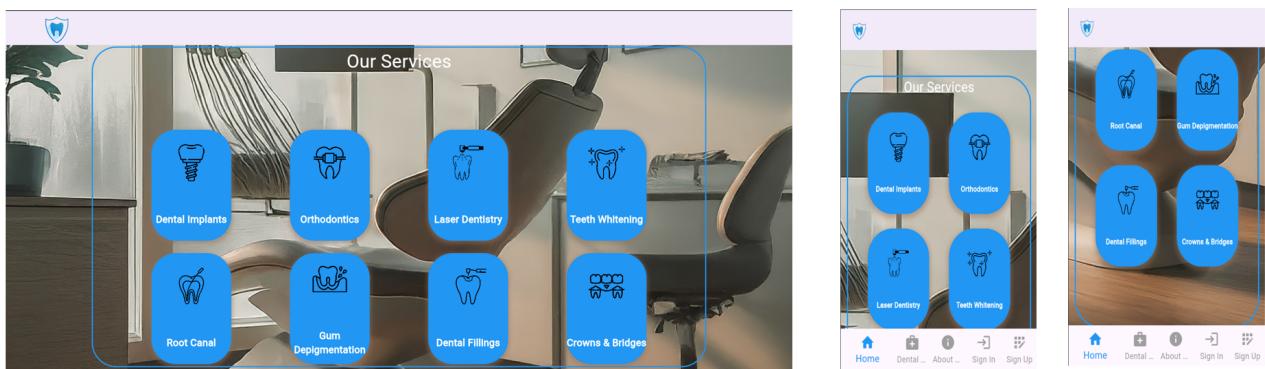


Figure 6.1: Home Page 1

On the home page, you will see a welcoming message and sign Up button. In the nav bar for both web and mobile it display the home , services , about us , sign in and sign up, we will explain what each button does.



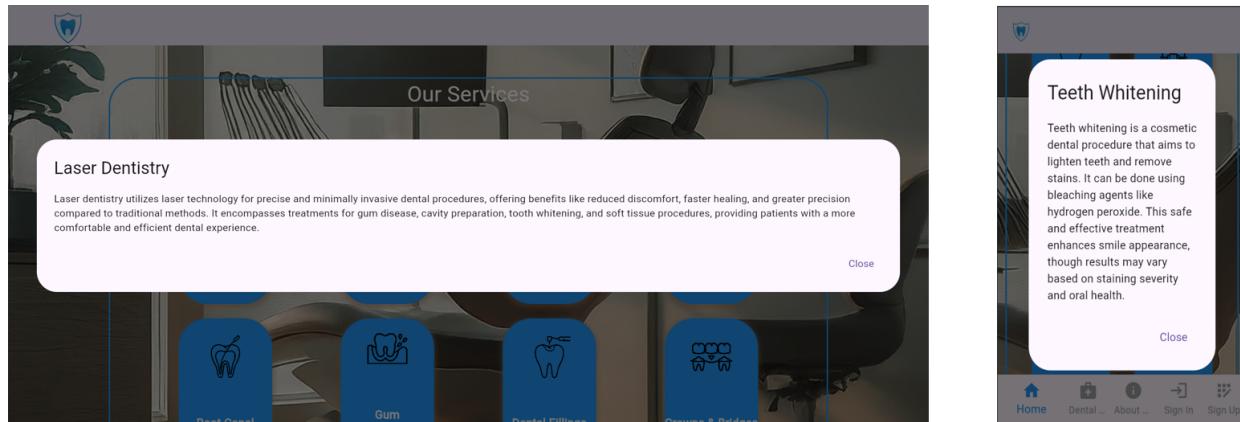


Figure 6.2: Home Page 2

Our services displays each service of the clinic that provide to the patient and when the user click on one of the services it is going to display the description of that service.

## 6.2.2 Services Page

Dental Services

**Dental Implants**  
Dental implants are titanium tooth roots placed into the jawbone to support replacement teeth. They offer a durable and natural-looking solution for missing teeth, enhancing chewing, speech, and overall oral health.

**Orthodontics**  
Orthodontics is a dental specialty aimed at correcting misaligned teeth and jaws for improved oral health and aesthetics. Treatments involve braces or aligners to gradually align teeth and address issues like overcrowding and bite problems, enhancing both appearance and function.

**Laser Dentistry**  
Laser dentistry utilizes laser technology for precise and minimally invasive dental procedures, offering benefits like reduced discomfort, faster healing, and greater precision compared to traditional methods. It encompasses treatments for gum disease, cavity preparation, tooth whitening, and soft tissue procedures, providing patients with a more comfortable and efficient dental experience.

**Teeth Whitening**  
Teeth whitening is a cosmetic dental procedure that aims to lighten teeth and remove stains. It can be done using bleaching agents like hydrogen peroxide. This safe and effective treatment enhances smile appearance, though results may vary based on staining severity and oral health.

**Root Canal**  
A root canal is a dental procedure that addresses infected or damaged tooth pulp by removing the affected tissue, cleaning the inside of the tooth, and sealing it to prevent further infection. This treatment alleviates pain, preserves the tooth, and restores its function, often followed by the placement of a crown for added protection and strength.

Dental Services

**Dental Implants**  
Dental implants are titanium tooth roots placed into the jawbone to support replacement teeth. They offer a durable and natural-looking solution for missing teeth, enhancing chewing, speech, and overall oral health.

**Orthodontics**  
Orthodontics is a dental specialty aimed at correcting misaligned teeth and jaws for improved oral health and aesthetics. Treatments involve braces or aligners to gradually align teeth and address

Home Dental services About Us Sign In Sign Up

## 6.3 Services Page

In this page it displays every service that the clinic provide along with the description of the service.

## 6.2.3 About Us Page

About Us

**Dr.Mansor Jasim**  
Welcome to Dr. Mansor Jasim, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Mansor Jasim for a dental experience that combines expertise and empathy.

**Dr.Fatima ali**  
Welcome to Dr. Fatima ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Fatima ali for a dental experience that combines expertise and empathy.

**Dr.Jaffar ali**  
Welcome to Dr. Jaffar ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Jaffar ali for a dental experience that combines expertise and empathy.

**Dr.Ali hasan ali**  
Welcome to Dr. Ali hasan ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Ali hasan ali for a dental experience that combines expertise and empathy.

**Dr.Ali Hadi Talib**  
Welcome to Dr. Ali Hadi Talib, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Ali Hadi Talib for a dental experience that combines expertise and empathy.

About Us

**Dr.Mansor Jasim**  
Welcome to Dr. Mansor Jasim, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Mansor Jasim for a dental experience that combines expertise and empathy.

**Dr.Fatima ali**  
Welcome to Dr. Fatima ali, a dentist with expertise in creating radiant smiles. With personalized care, understanding each patient's unique needs, ensuring comfort and confidence. Trust Dr. Fatima ali for a dental experience that combines expertise and empathy.

Home Dental services About Us Sign In Sign Up

## 6.4 About Us Page

In This page it will display the all dentist in the clinic along with a description.

## 6.2.4 Login Page

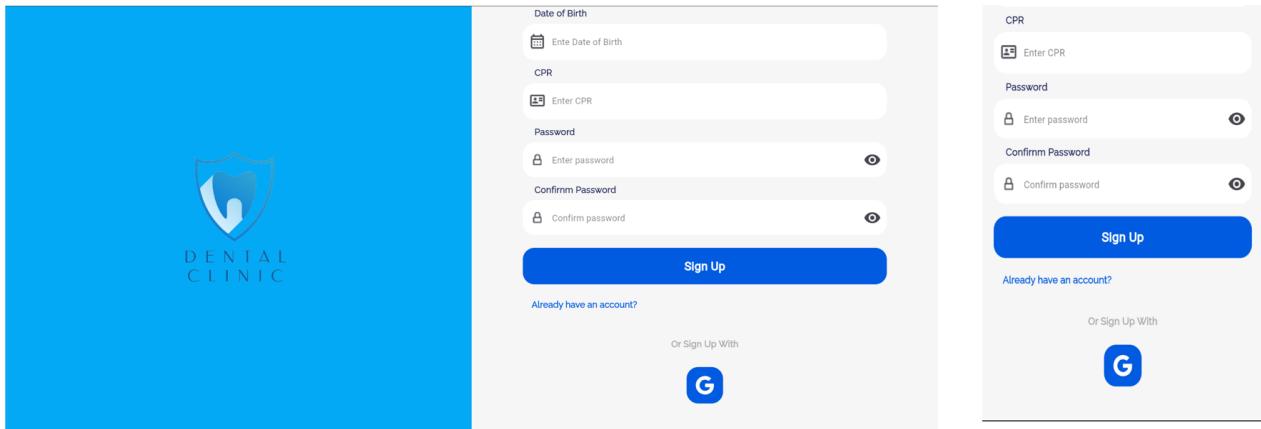
The image shows three versions of a login page side-by-side. All three versions feature a blue header with the text "Let's Sign In" and a small lock icon. Below the header, there is a message: "Hey, Enter your details to get sign in to your account." The first version on the left has a light gray background and includes fields for "Email" (with placeholder "Enter email") and "Password" (with placeholder "Enter password" and a visibility icon). It also features a large blue "Sign In" button and links for "Forgot Password?" and "Sign Up". The middle version is a dark blue template and only displays the "DENTAL CLINIC" logo. The third version on the right has a white background and includes fields for "Email" and "Password", along with a "Sign In" button. It also includes links for "Forgot Password?", "Sign Up", and "Or Sign in With" followed by a Google "G" icon.

## 6.5 Login Page

In the Login Page where all users should login using their email and password

## 6.2.5 Sign Up Page

The image shows two versions of a sign-up page. The left version is a dark blue template featuring the "DENTAL CLINIC" logo. The right version has a white background and is titled "Let's Sign Up" with a lock icon. It includes a message: "Hey, Enter your details to create a new account." Below the title are several input fields: "Email" (placeholder "Enter email"), "Full Name" (placeholder "Enter Full Name"), "Phone Number" (placeholder "Enter Your phone number"), "Gender" (radio buttons for "Male" and "Female" with "Male" selected), and "Date of Birth" (calendar icon placeholder "Enter Date of Birth"). To the right of the form, there is a sidebar with additional fields: "Email" (placeholder "Enter email"), "Full Name" (placeholder "Enter Full Name"), "Phone Number" (placeholder "Enter Your phone number"), "Gender" (radio buttons for "Male" and "Female" with "Male" selected), and "Date of Birth" (calendar icon placeholder "Enter Date of Birth").

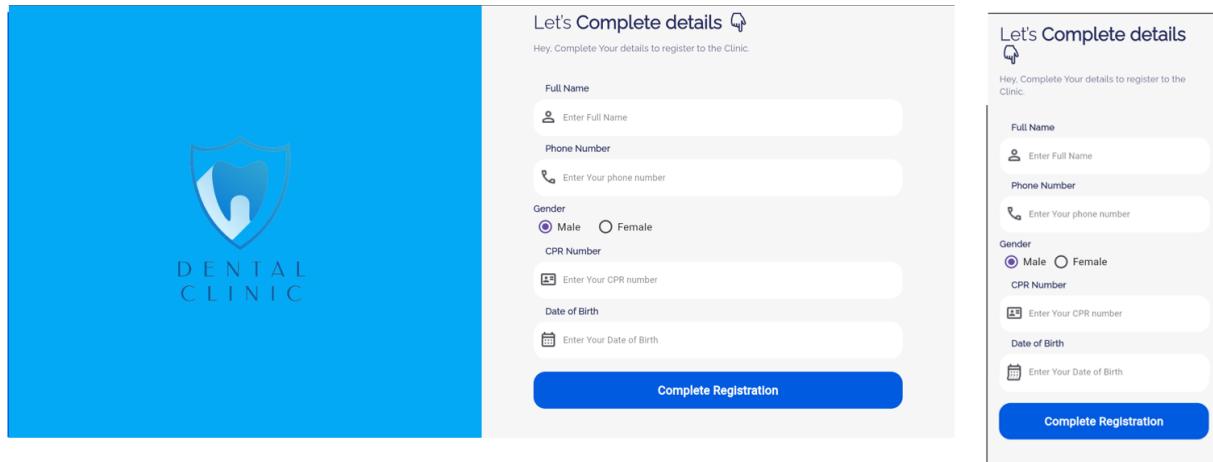


The sign up page is designed for patients to register. It features a blue header with the 'DENTAL CLINIC' logo. The main form area contains fields for Date of Birth, CPR, Password, and Confirm Password, each with an 'Enter' placeholder. A large blue 'Sign Up' button is centered below these fields. Below the button, there's a link to 'Already have an account?' and an 'Or Sign Up With' section featuring a 'G' icon.

Figure 6.6 Sign up Page

The sign Up page is exclusive for the Patients that they want to Sign Up to the system.

#### 6.2.6 Complete details Page



This page is part of the sign-up process for Gmail users. It has a blue header with the 'DENTAL CLINIC' logo. The main title is 'Let's Complete details' with a question mark icon. Below it, a sub-instruction reads 'Hey, Complete Your details to register to the Clinic.' The form includes fields for Full Name, Phone Number, Gender (radio buttons for Male and Female), CPR Number, and Date of Birth, each with an 'Enter' placeholder. A large blue 'Complete Registration' button is at the bottom.

Figure 6.7 Complete details Page

This Page only displayed to the patient when the patient choose to sign Up using the gmail.

## 6.2.7 Reset Password Page

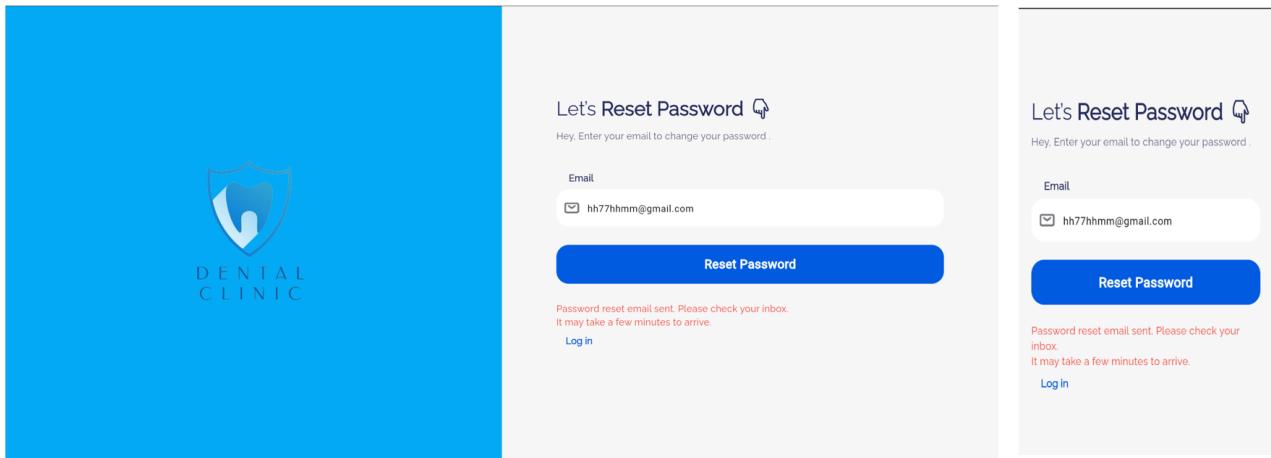


Figure 6.8 Reset Password Page

In this page the patient should input the email to send an email that reset the password and create a new password.

## 6.2.8 Patients Screens

### 6.2.8.1 Patient Home Page

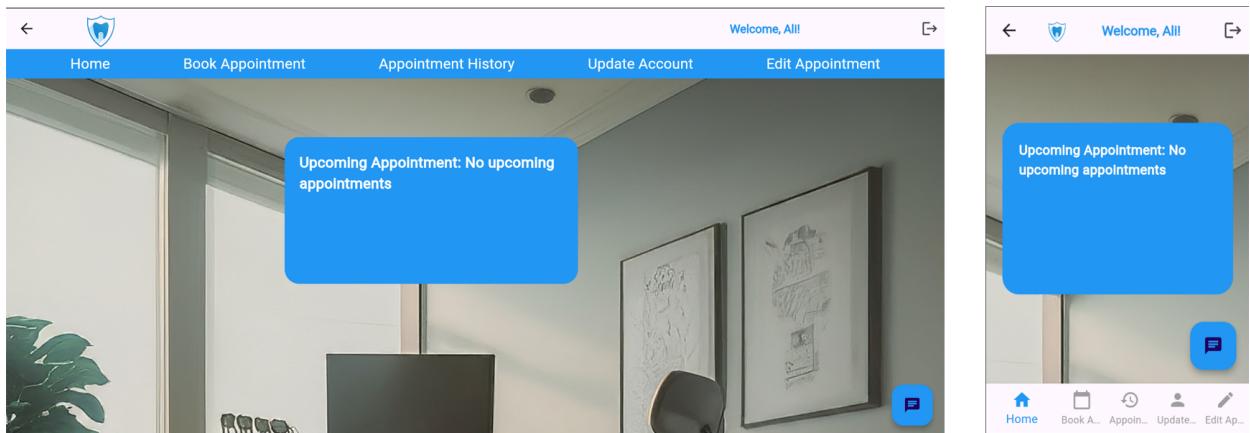


Figure 6.9 Patient Home Page

After the patient sign into the system it is going to display the first name of the user and the Upcoming appointment. It have also a Nav bar that displays the Home , Book Appointment , Appointment History, Update Account and Edit Appointment. Also it has a chat channel that the patient can chat with admin or reception.

### 6.2.8.2 Booking Page

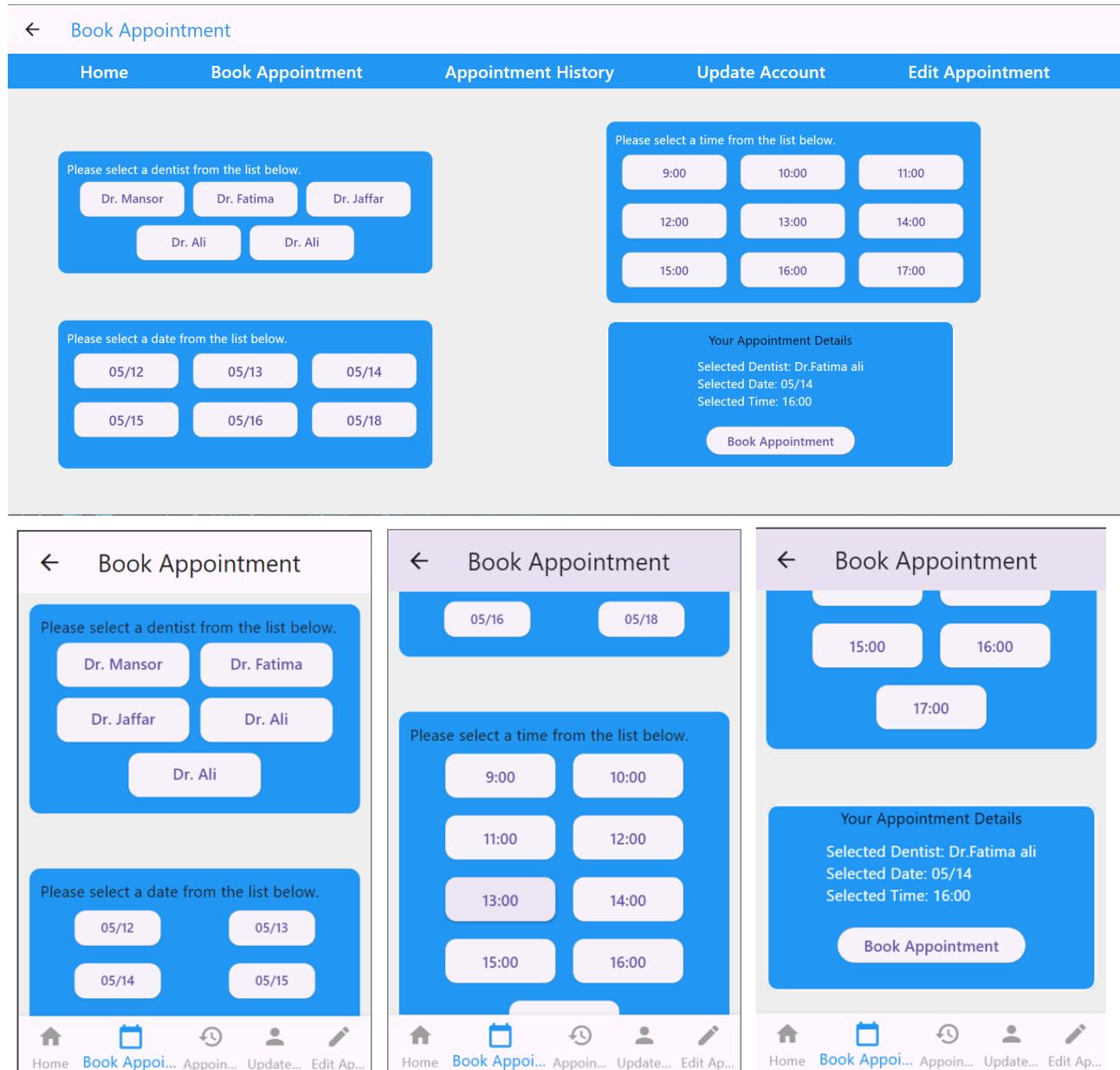


Figure 6.10 Booking Page

In the booking page the patient can choose the dentist , the date and the time. after that it will display the details of the booking and button book appointment.

### 6.2.8.3 Appointments History Page

The left screenshot displays a list of three past appointments:

- Dentist: Dr.Ali Date: 2024-5-1 Time: 11:00
- Dentist: Dr.Fatima Date: 2024-5-6 Time: 12:00
- Dentist: Dr.Mansor Date: 2024-5-9 Time: 11:00

The right screenshot shows a similar list with a header row and a bottom navigation bar.

Figure 6.11 Appointments History Page

In this page it will display the appointment that have been booked before.

### 6.2.8.4 Update Account Page

The left screenshot shows a form with fields for:

- Full Name: All mohamed hasan
- CPR: 020705421
- Date of Birth: 28/07/2002
- Gender: Male (radio button selected)
- Phone Number: 34566543

The right screenshot shows a similar form with additional fields for:

- Full Name: All mohamed hasan
- CPR: 020705421
- Date of Birth: 28/07/2002
- Gender: Male (radio button selected)
- Phone Number: 34566543

Figure 6.12 Update Account Page

This page where the patient can update his/her details and displays a button that update the details.

### 6.2.8.6 Edit Appointment Page

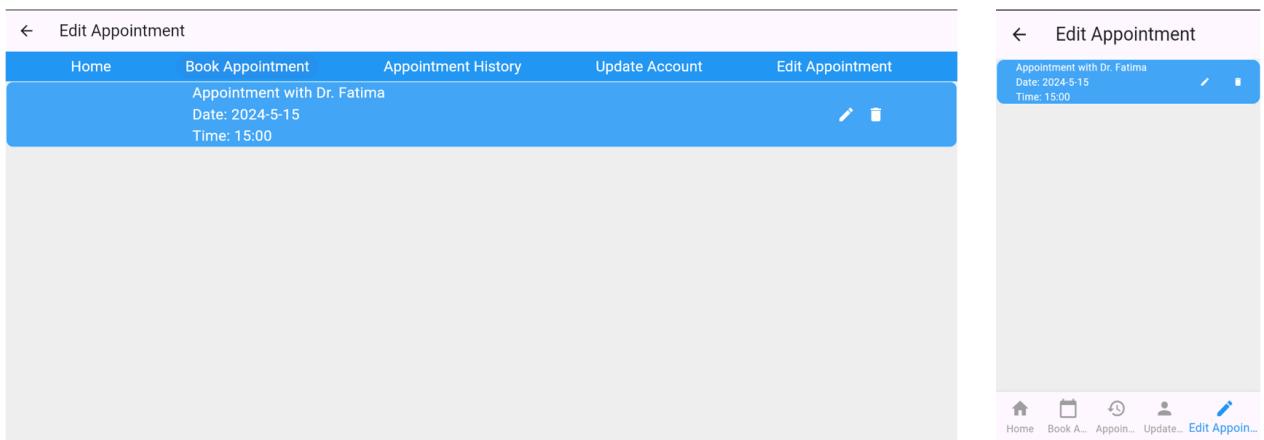


Figure 6.13 Edit Appointment Page

In This page the patient can either delete the appointment that is still did not pass its time or update the appointment which can lead it to Update Appointment Page.

### 6.2.8.7 Update Appointment Page

The image shows a 'Update Appointment' page with four main sections. 1) A top-left section titled 'Please select a dentist from the list below.' containing buttons for 'Dr. Mansor', 'Dr. Fatima', 'Dr. Jaffar', and two instances of 'Dr. Ali'. 2) A top-right section titled 'Please select a time from the list below.' containing a 4x3 grid of time slots: 9:00, 10:00, 11:00; 12:00, 13:00, 14:00; 15:00, 16:00, 17:00. 3) A bottom-left section titled 'Please select a date from the list below.' containing a 4x2 grid of dates: 05/13, 05/14, 05/15; 05/16, 05/18. 4) A bottom-right summary section titled 'Your Appointment Details' showing 'Selected Dentist: Dr.Fatima', 'Selected Date: 05/13', and 'Selected Time: 14:00', with a 'Update appointment' button at the bottom.

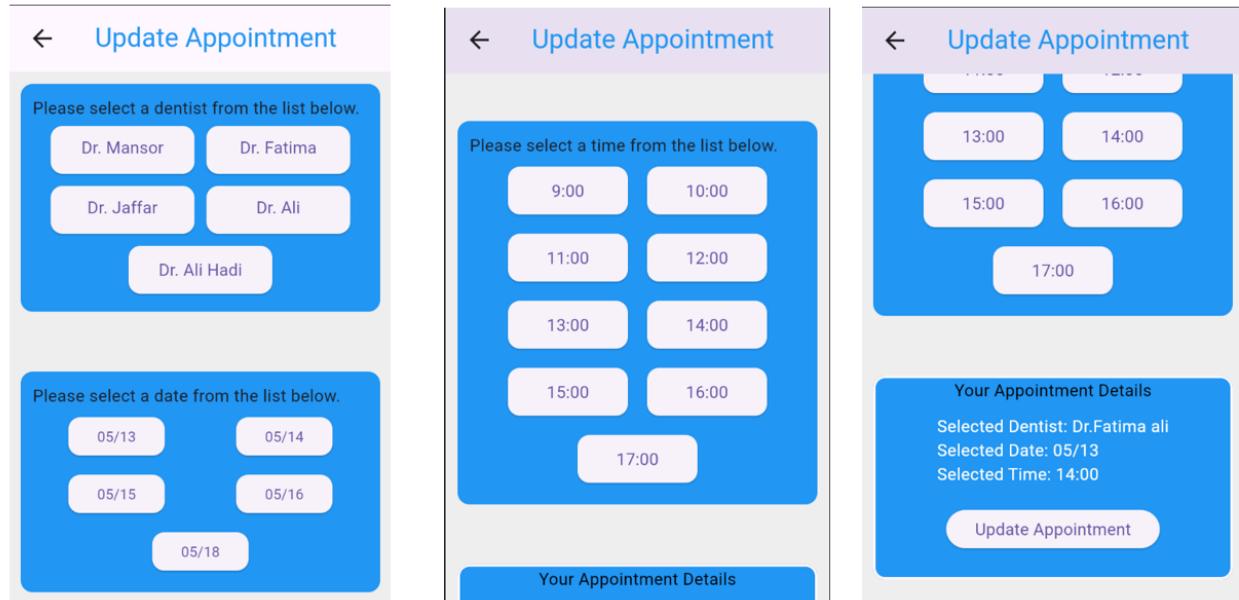
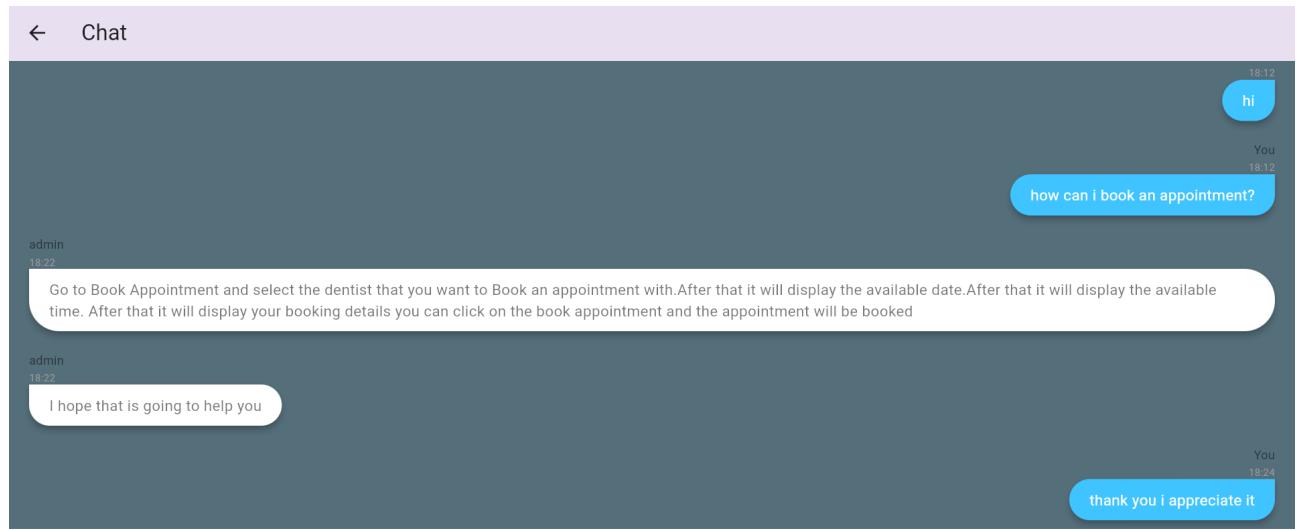


Figure 6.14 Update Appointment Page

A screen similar to the booking page will appear after the user selects to change the appointment, allowing the patient to make changes.

#### 6.2.8.8 Chat page



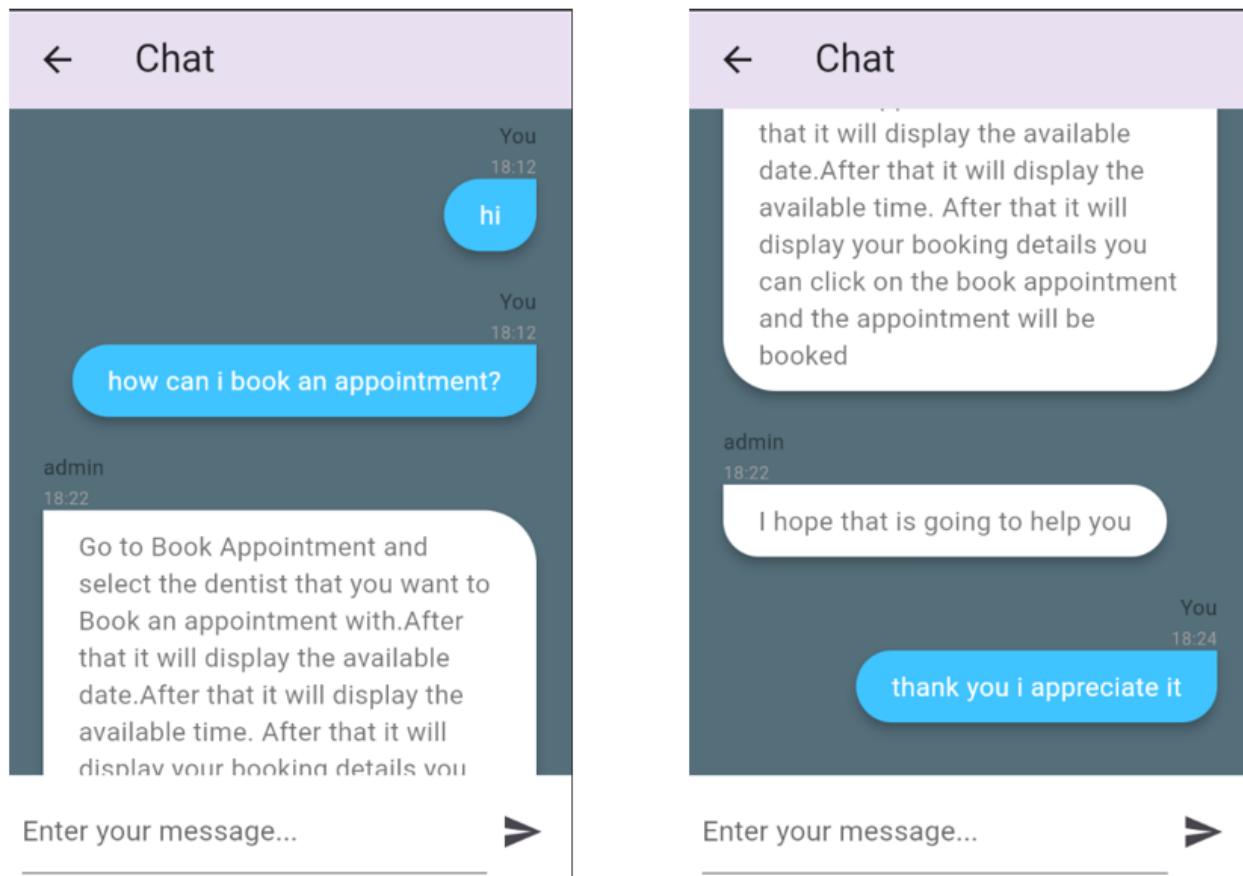


Figure 6.15 Chat Page

The patient may chat with the administrator or reception on this page about any connected to the system problem.

## 6.2.9 Admin Screens

### 6.2.9.1 Dashboard page

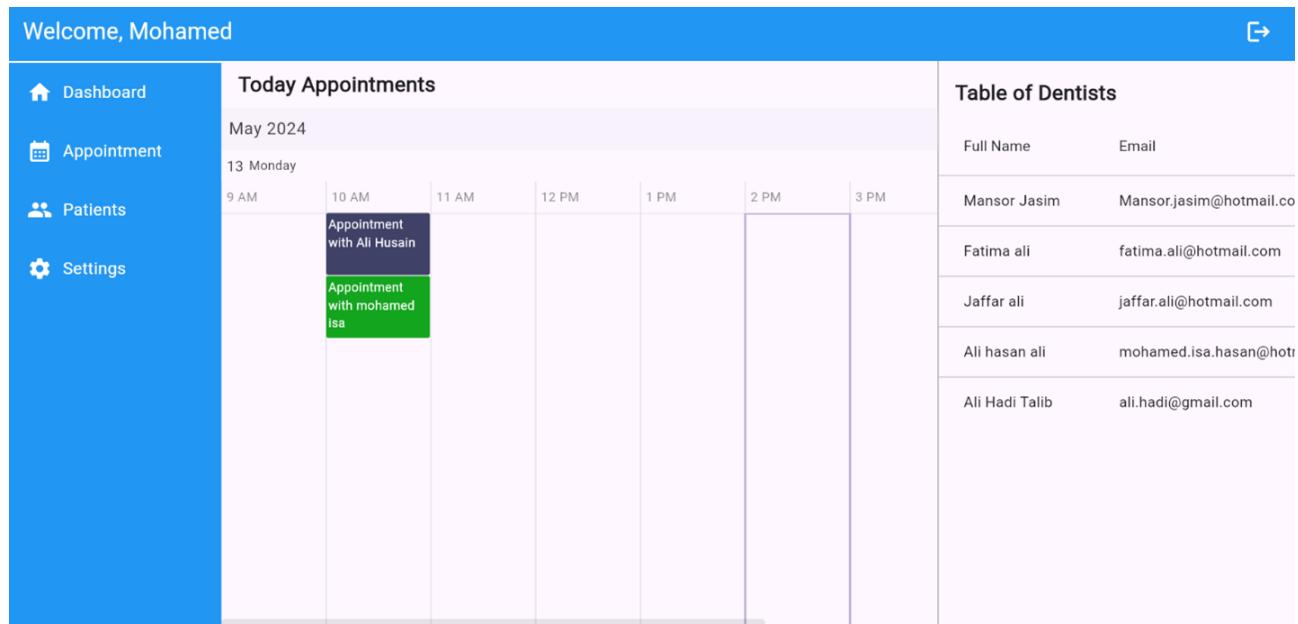


Figure 6.16 Dashboard Page

Upon login into the system, the administrator is automatically sent to the dashboard. The dashboard contains a full list of dentists who are currently in practice at the clinic, along with their contact information, which includes email addresses. It also has a calendar with the day's schedules shown on it, including dental appointments color-coded. The process of identifying busy periods is made easier with this organizational approach. In addition, a sidebar menu provides quick access to additional system features, such as the patient page and other pages. Regarding the header part, the administrator receives a personalized welcome message with their name when they log in to the system. Furthermore, an icon on right-hand side gives them the flexibility to log out of the system whenever they wish.

### 6.2.9.2 Appointments page

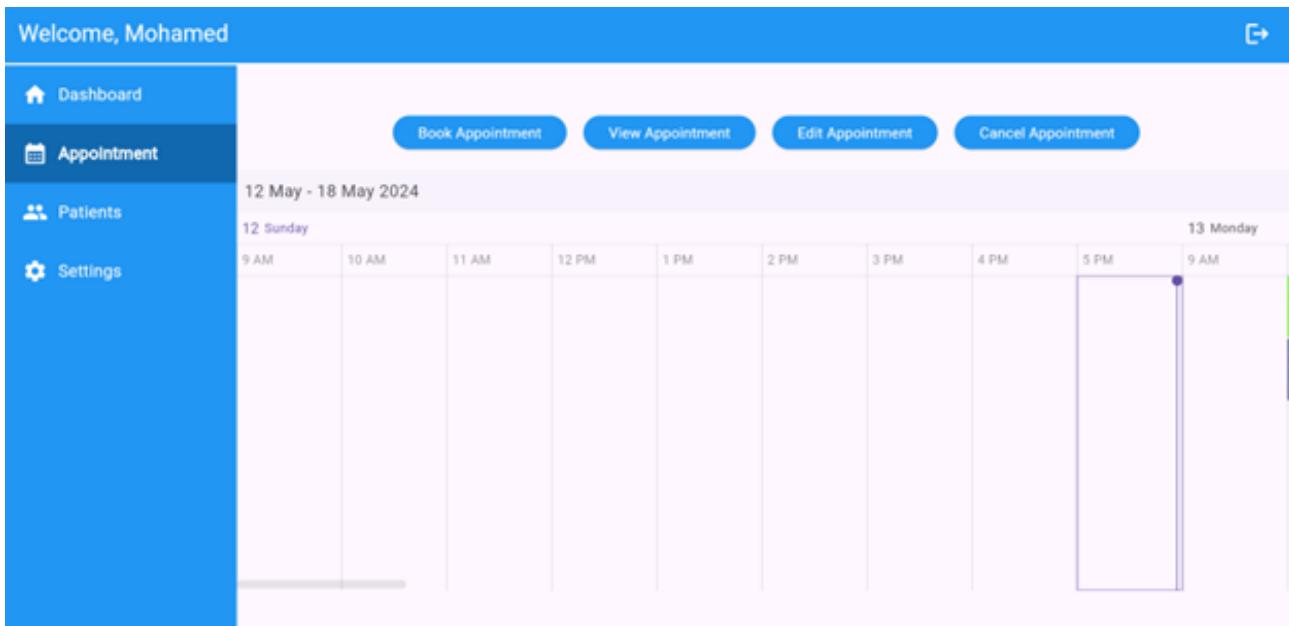


Figure 6.17 Appointments Page

There is a calendar on the appointment page that is fixed to this week, showing the appointment for this week. Four buttons—book appointment, view appointment, edit appointment, and cancel appointment—are displayed on this page. The clinic appointment schedule is accessible to the user through these buttons.

### 6.2.9.3 Admin Booking page

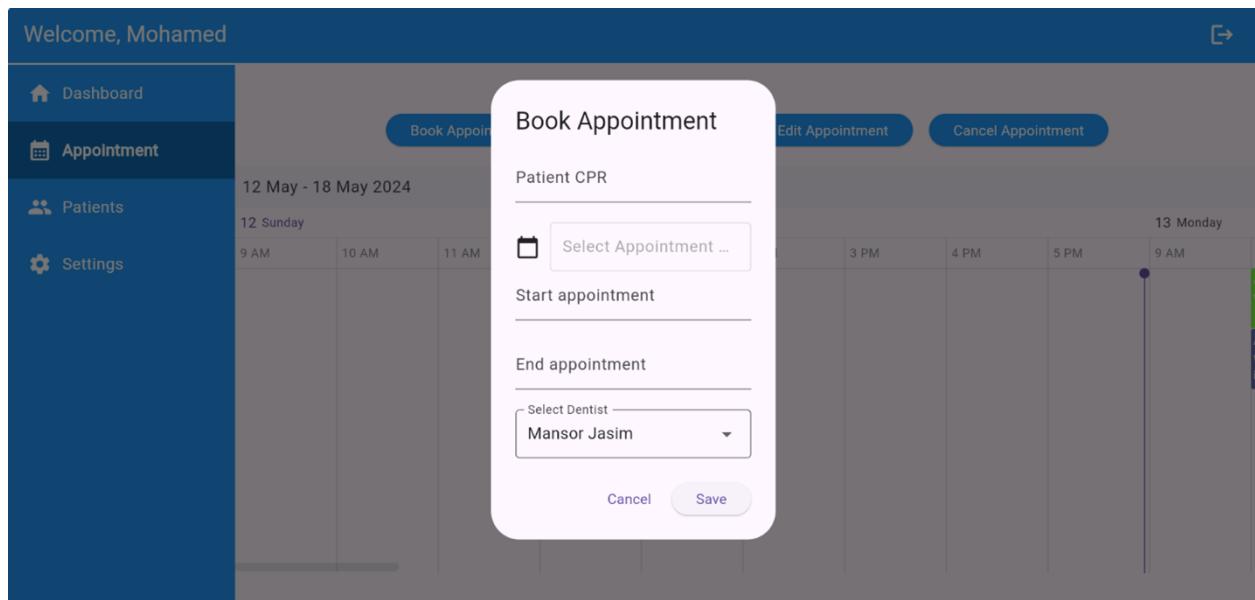


Figure 6.18 Admin Booking Page

When the "book appointment" button is clicked, a form requesting the patient's CPR, appointment date, start and end appointment, and dentist list will appear on the screen. If the CPR is found in the system, the appointment will be scheduled successfully; if it is not, a notification stating that a new patient must be added from the patients' page will be displayed. The user may simply choose a date for the appointment by seeing the calendar displayed by the system. Additionally, starting and ending appointments will allow the clinic greater flexibility in terms of defining the duration of the appointments. The appointment will then be scheduled by clicking the save button.

#### 6.2.9.4 View Appointment page

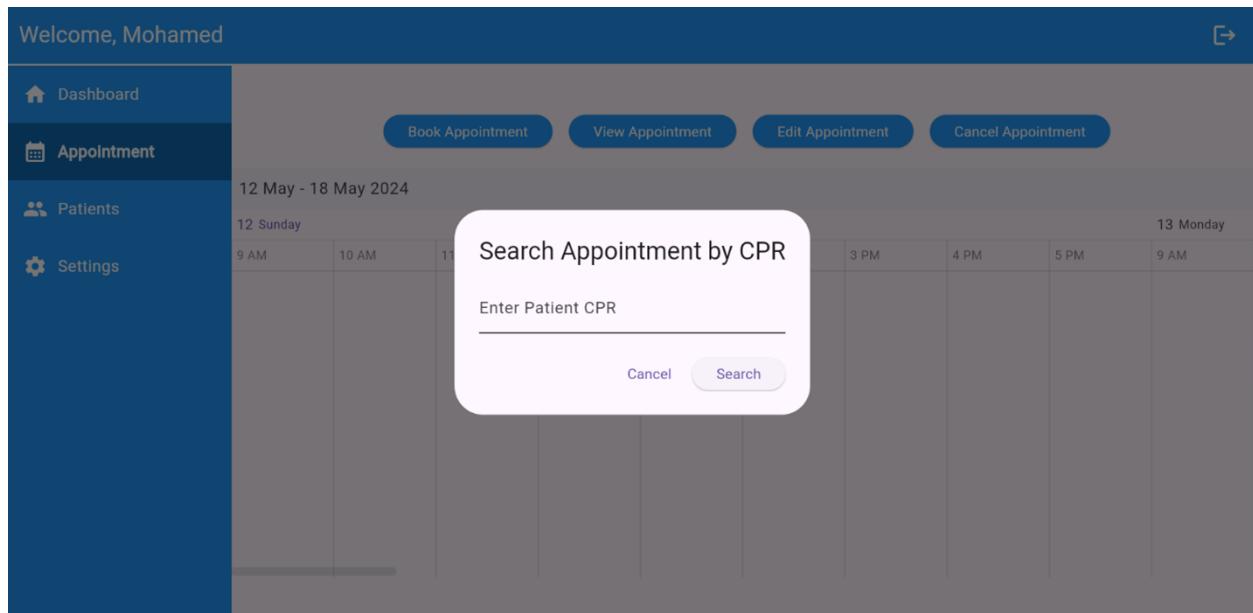


Figure 6.19 View Appointment Page

When a user clicks "view appointment," a form requesting CPR from the patient is displayed. The system then verifies that the CPR is in the database. When a user clicks "search," the system displays the patient's appointment; if the CPR is not found, an error notification is displayed.

### 6.2.9.5 Appointment Information page

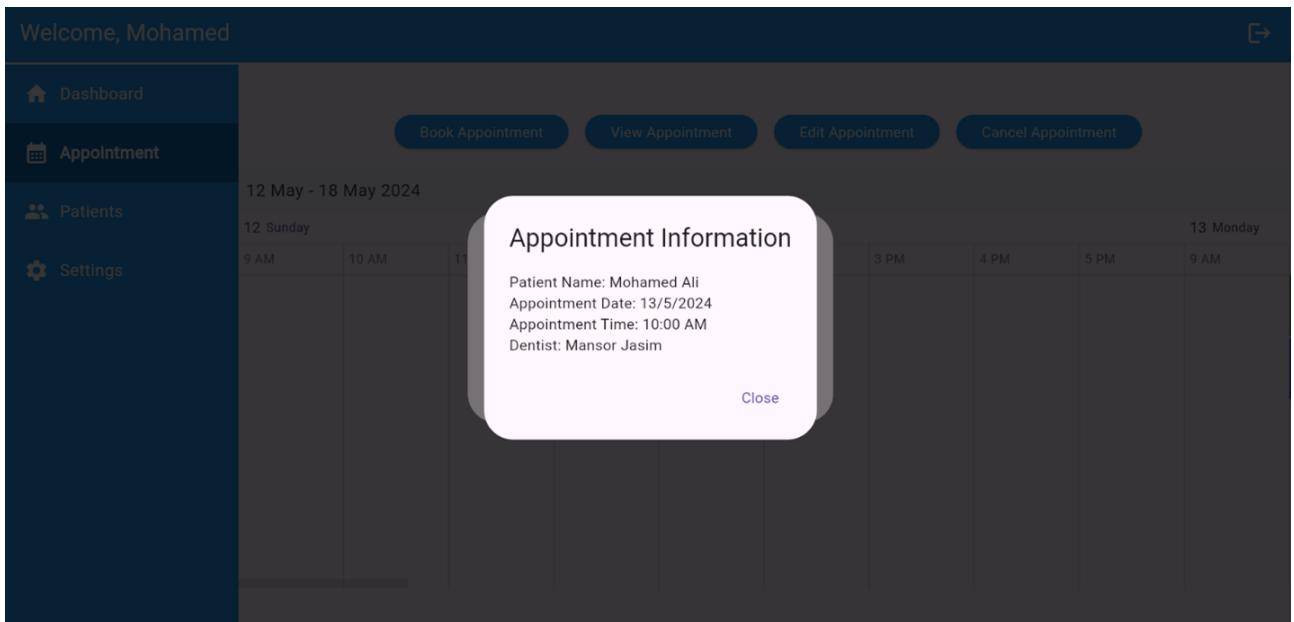


Figure 6.20 Appointment Information Page

If the CPR is found in database.

#### 6.2.9.6 Admin Edit Appointment page

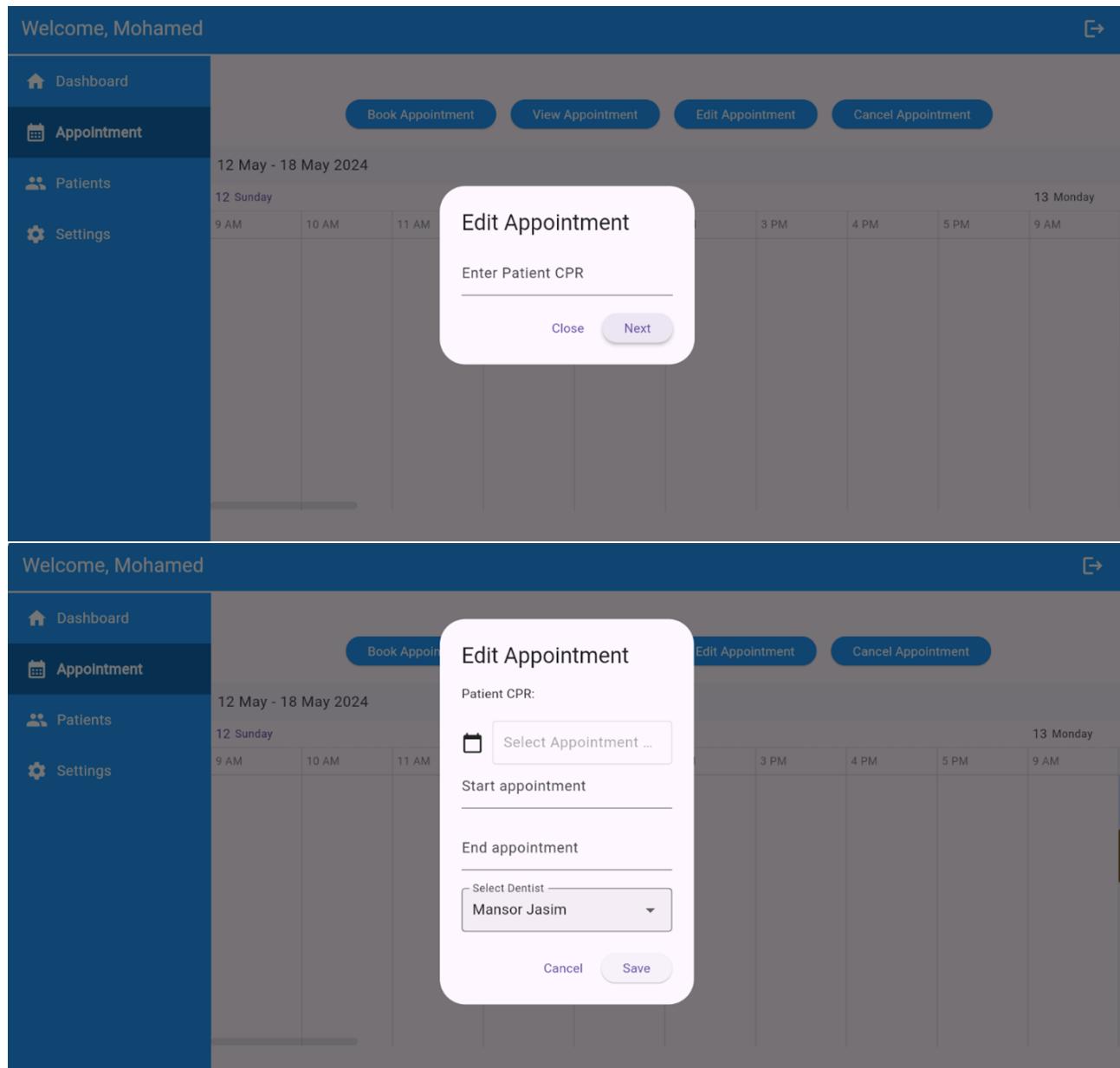


Figure 6.21 Appointment Information Page

When the user clicks on the "Edit Appointment" button, a form will pop up, prompting the user to enter the CPR (Civil Personal Record) number. Upon clicking "Next", the system will verify whether the patient has an existing appointment at our clinic. If the system confirms the patient's appointment, another form, similar to the appointment booking form, will be displayed. The key distinction is that in this edit form, the fields will be pre-filled with existing appointment details, allowing the user to edit them, except for the CPR field.

#### 6.2.9.7 Cancel Appointment page

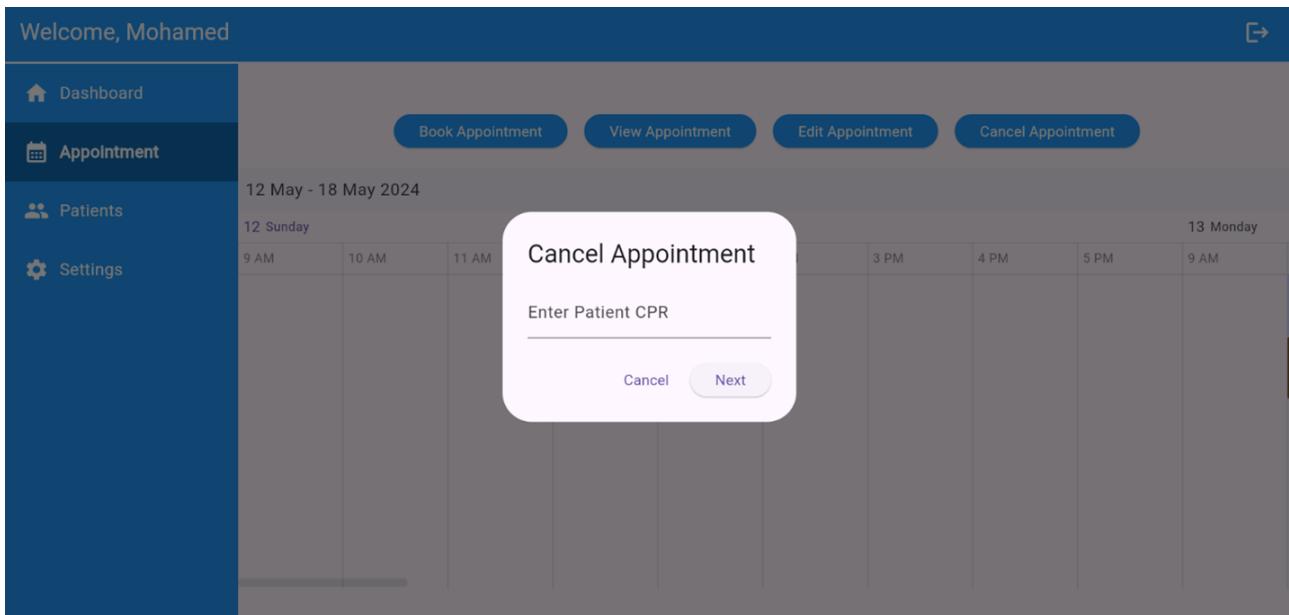


Figure 6.22 Cancel Appointment Page

When clicking cancel appointment buttons, the system will display form that take the patient CPR and the system will check and search for the appointment.

#### 6.2.9.8 Confirm Cancel Appointment page

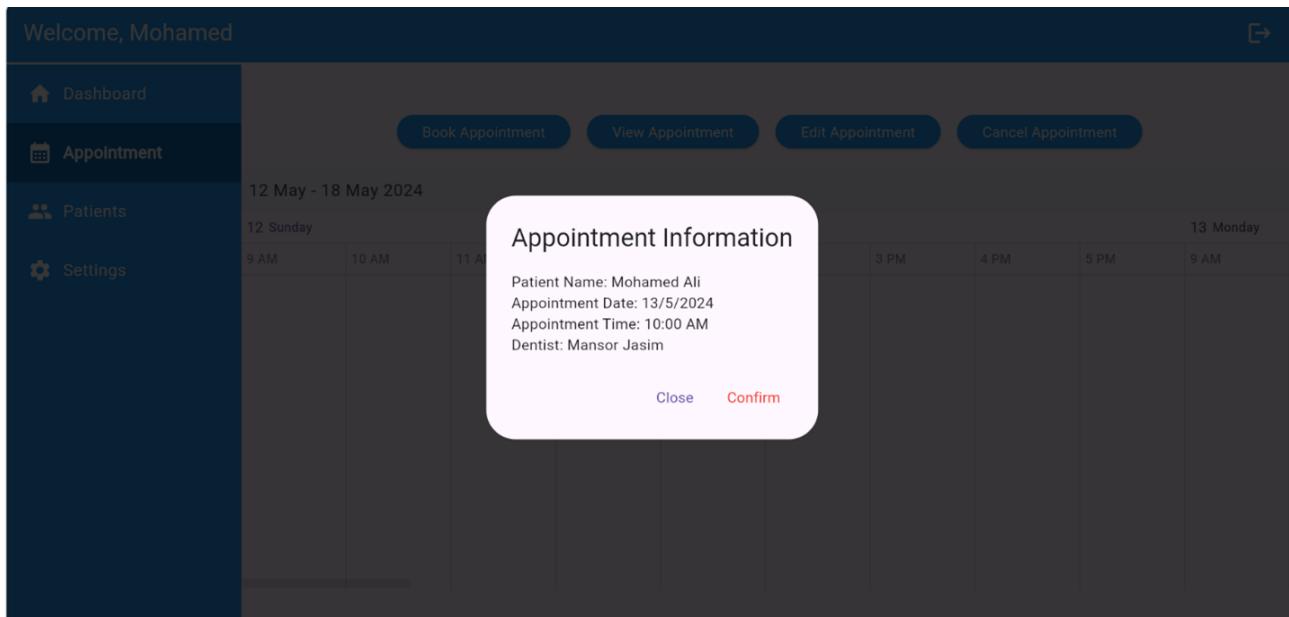


Figure 6.23 Confirm Cancel Appointment Page

The user will see the appointment details to fully confirm that this is the appointment that will be canceled. By selecting "Confirm," the appointment will be deleted.

#### 6.2.9.9 Patient List page

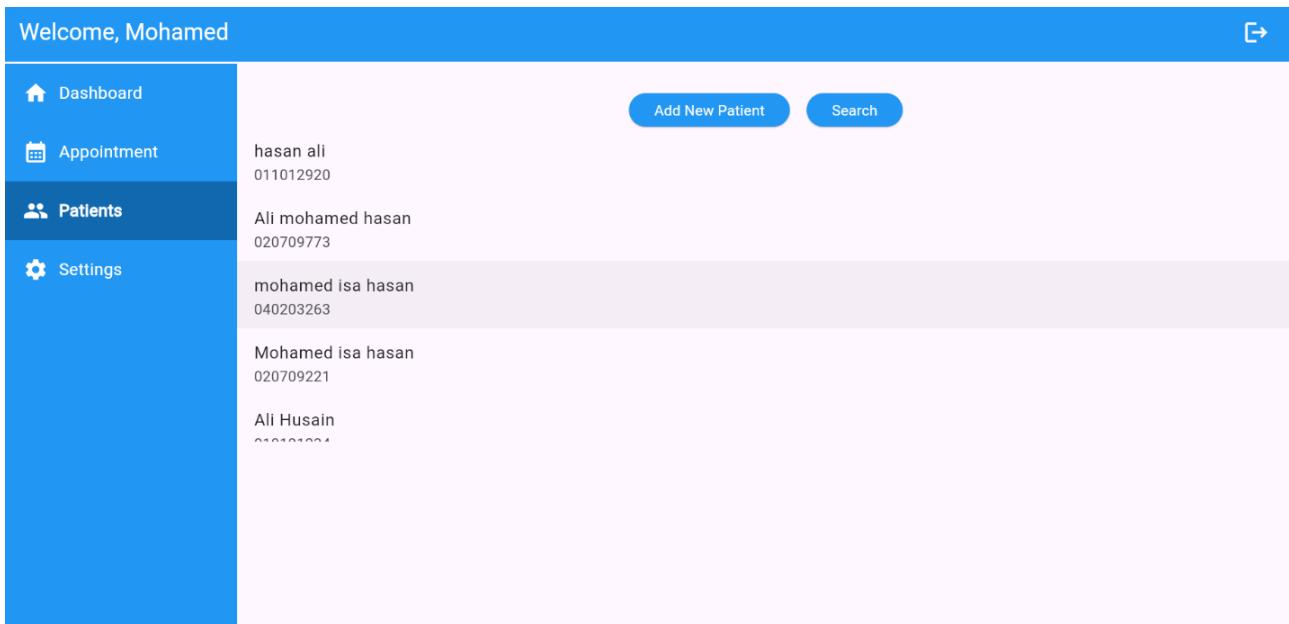


Figure 6.24 Patient List Page

The patient page will open once you choose the "Patient" option from the side menu. This page lists all of the patients that are kept in the clinic database, along with their names and CPR. There are also two buttons accessible: one to search among current patients and the other to add a new patient.

#### 6.2.9.10 Search Patient page

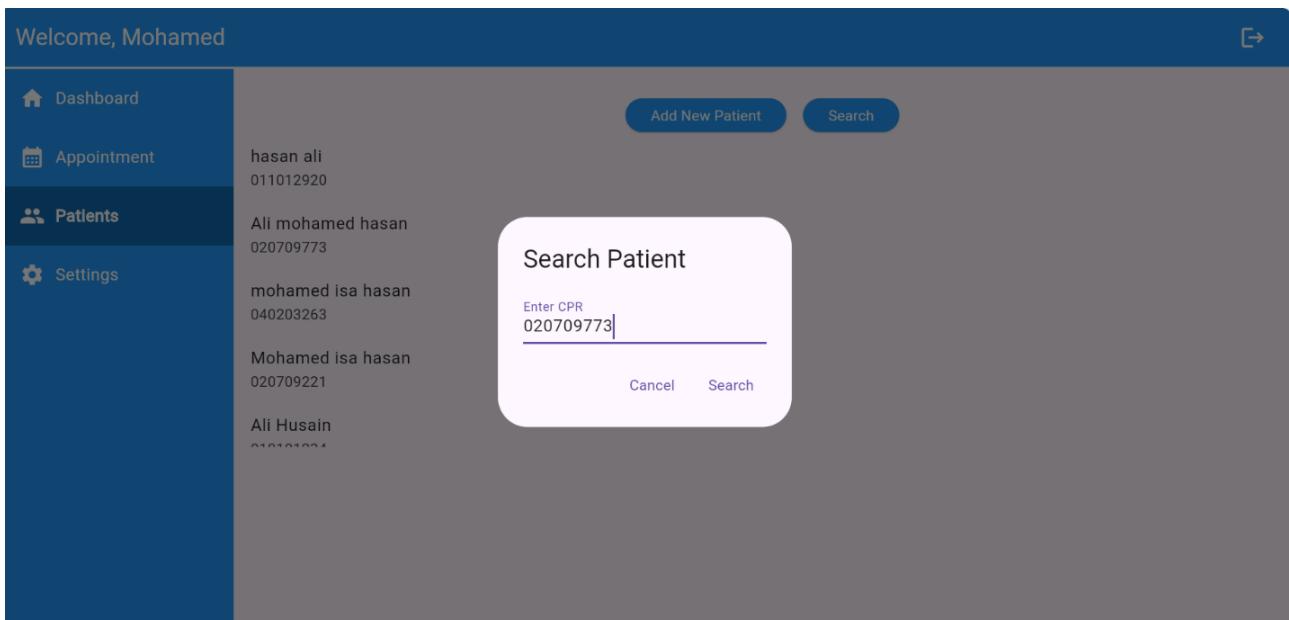


Figure 6.25 Search Patient Page

When the user presses the search button, the system will prompt them to enter the patient's CPR. After the CPR is entered, the system will check if the CPR exists in the database and matches with a record in the patient table. If a match is found, the system will navigate the user to another page named "Patient Details."

#### 6.2.9.10 Patient Details page



Figure 6.26 Patient Details Page

This page can be accessed either by clicking on the patient from the table or by searching using the search button. On this page, the system retrieves the patient's information from the database and displays it. Additionally, there is a button at the bottom of the page that enables the user to send a message to the patient, facilitating communication and the building of a conversation between them.

### 6.2.9.11 Admin Chat page

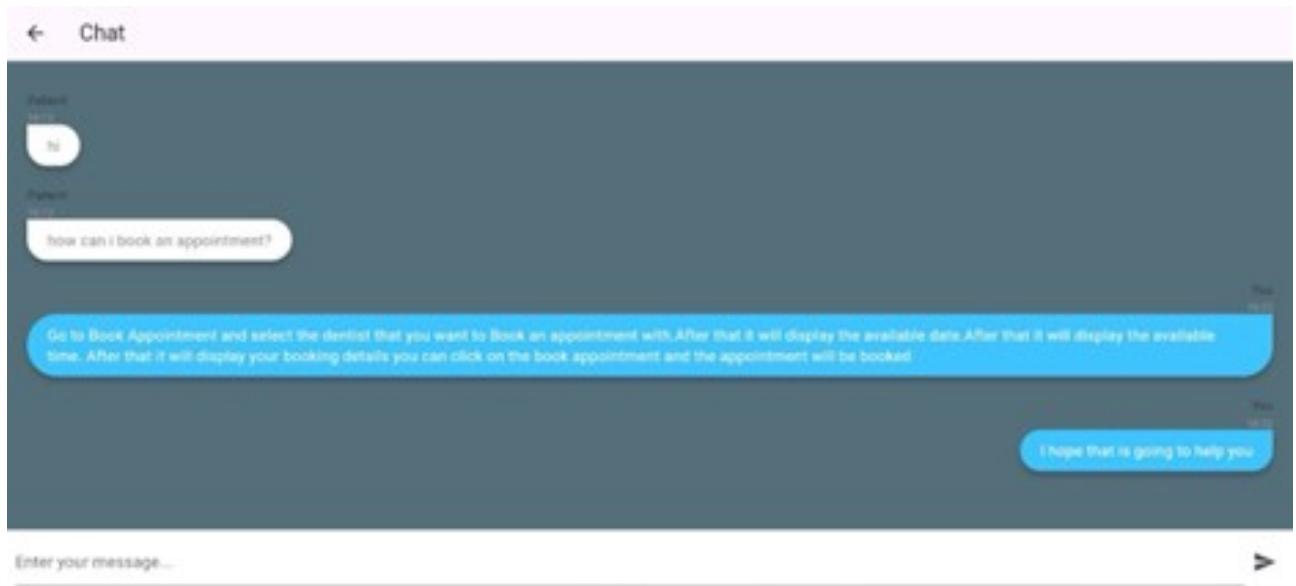


Figure 6.27 Admin Chat Page

When the user clicks on the button in the patient details page, the system will open a chat channel where the user can communicate with the patient easily.

### 6.2.9.12 Settings page

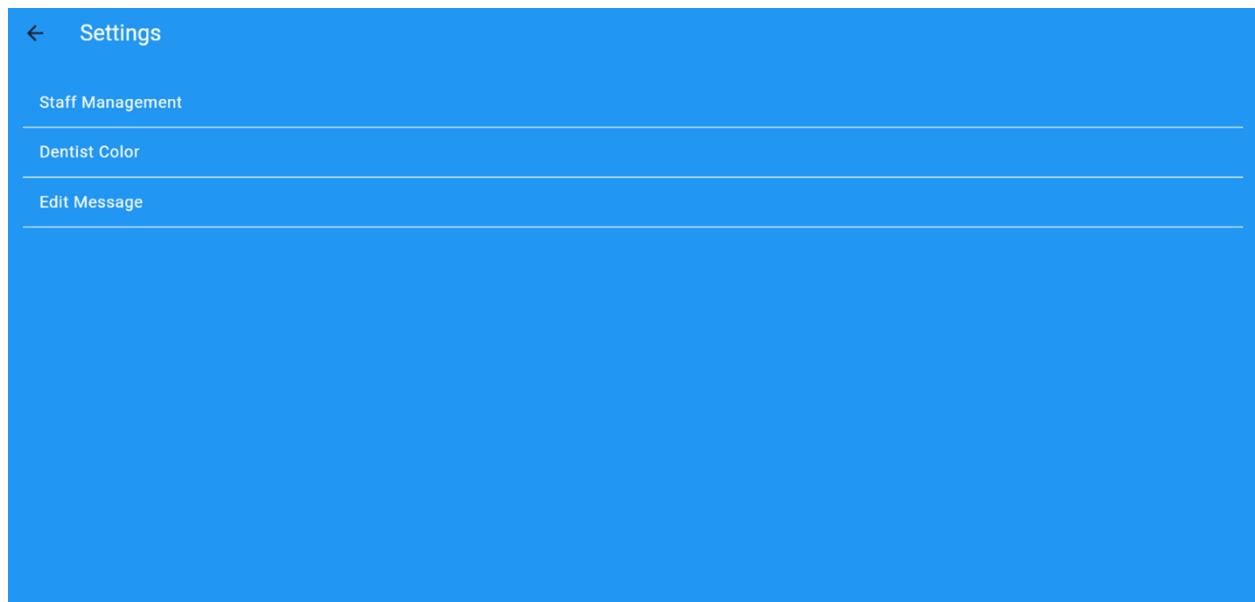


Figure 6.28 Settings Page

This page will appear whenever the user clicks on "Settings" in the side menu. Here, the user will have control over various aspects of the clinic. They can easily modify the welcome message on the home page, manage staff, and assign colors to dentists to differentiate them in the calendar.

#### 6.2.9.13 Staff List page

← Staff Management	
Mansor Jasim Mansor.jasim@hotmail.com Dentist	trash
Mohamed isa hasan mohamed.isa.has.s@hotmail.com Admin	trash
Fatima ali fatima.ali@hotmail.com Dentist	trash
Jaffar ali jaffar.ali@hotmail.com Dentist	trash
Ali hasan ali mohamed.isa.hasan@hotmail.com Dentist	trash
Ali Hadi Talib ali.hadi@gmail.com Dentist	trash
	+

Figure 6.29 Staff List Page

After the user clicks on "Staff Management," this page will appear. The system will display a table containing staff information such as names, email addresses, and their roles in the clinic. The user can delete staff from the system by clicking on the trash icon, and they can also add new staff by clicking on the addition icon.

#### 6.2.9.14 Add Staff page

← Staff Management	
Mansor Jasim Mansor.jasim@hotmail.com Dentist	trash
Mohamed isa hasan mohamed.isa.has.s@hotmail.com Admin	trash
Fatima ali fatima.ali@hotmail.com Dentist	trash
Jaffar ali jaffar.ali@hotmail.com Dentist	trash
Ali hasan ali mohamed.isa.hasan@hotmail.com Dentist	trash
Ali Hadi Talib ali.hadi@gmail.com Dentist	trash
	+

#### Add Staff Member

Full Name \_\_\_\_\_

CPR \_\_\_\_\_

Email \_\_\_\_\_

Phone Number \_\_\_\_\_

Birthday \_\_\_\_\_

Gender  
**Male**

Role  
**Admin**

Figure 6.30 Staff List Page

After the user clicks the addition icon on the Staff Management page, the system will display a form to gather information about the staff and add it to the database and system.

The form will prompt the user to enter the staff's name, CPR, email, phone number, birthday, and select gender. Additionally, the user will choose the staff's role in the clinic from a drop-down menu.

#### 6.2.9.15 Dentist Color Setting page

The screenshot shows a web-based application interface for managing dentist colors. At the top left is a back arrow labeled "Dentist Color Settings". Below it is a title "Table of Dentists". The main content is a table with five rows, each representing a dentist. The columns are "Full Name", "Email", and "Color". The "Color" column contains a dropdown menu with "Red" selected. At the bottom right of the table area are two buttons: "Cancel" and "Update".

Full Name	Email	Color
Mansor Jasim	Mansor.jasim@hotmail.com	Red ▾
Fatima ali	fatima.ali@hotmail.com	Red ▾
Jaffar ali	jaffar.ali@hotmail.com	Red ▾
Ali hasan ali	mohamed.isa.hasan@hotmail.com	Red ▾
Ali Hadi Talib	ali.hadi@gmail.com	Red ▾

Figure 6.31 Dentist Color Setting page

From the settings page, the user can access this page by clicking on "Dentist Color Settings." The primary purpose of this page is to give the user control over the colors displayed in the calendars. The system will display a table of dentists containing their names, emails, and a dropdown menu that allows the user to change the colors associated with each dentist. By clicking the update button, the database will update.

#### 6.2.9.16 Edit Welcome Message page

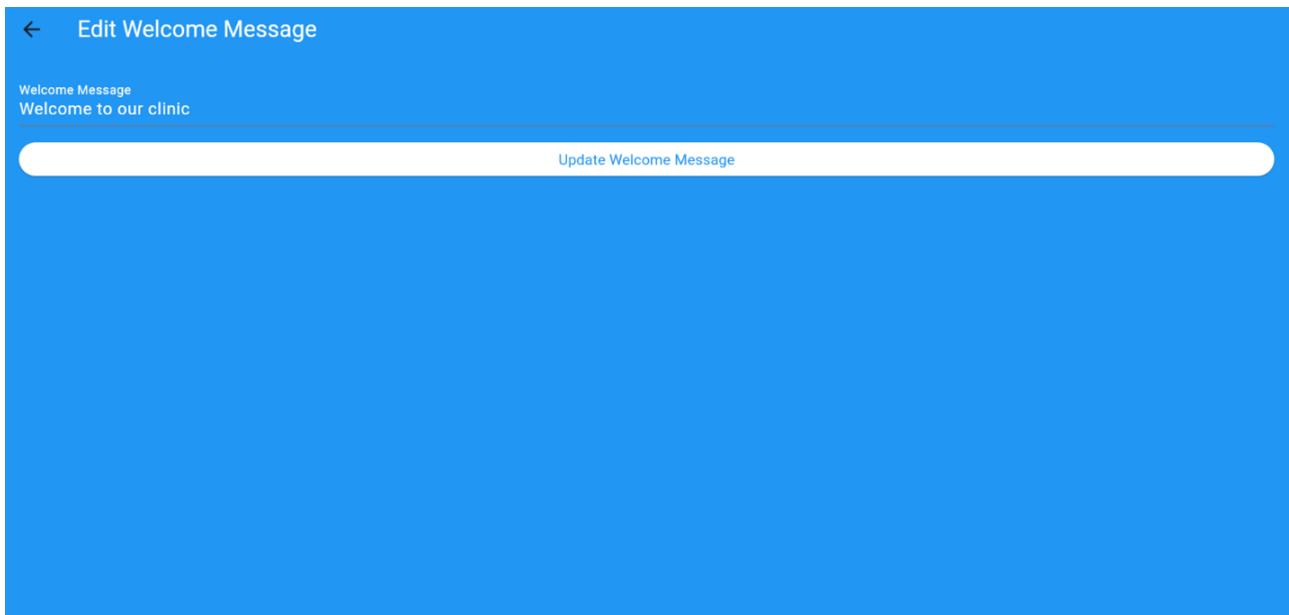


Figure 6.32 Edit Welcome Message page

To access this page, the user clicks on "Edit Welcome Message" from the settings. It contains a text field where the user can enter a new message or modify the existing one. By clicking the button at the bottom of the text field, the message will be updated in the database. When the user navigates to the home page, the welcome message will reflect the changes made by the user.s

#### 6.2.10 Dentist Screens

##### 6.2.10.1 Dentist Home Page

When the dentist logs into the system, they will be directed to the default page, where a calendar showcasing their appointments for the day is prominently displayed. Each appointment will be represented as a card, colored blue for easy identification.

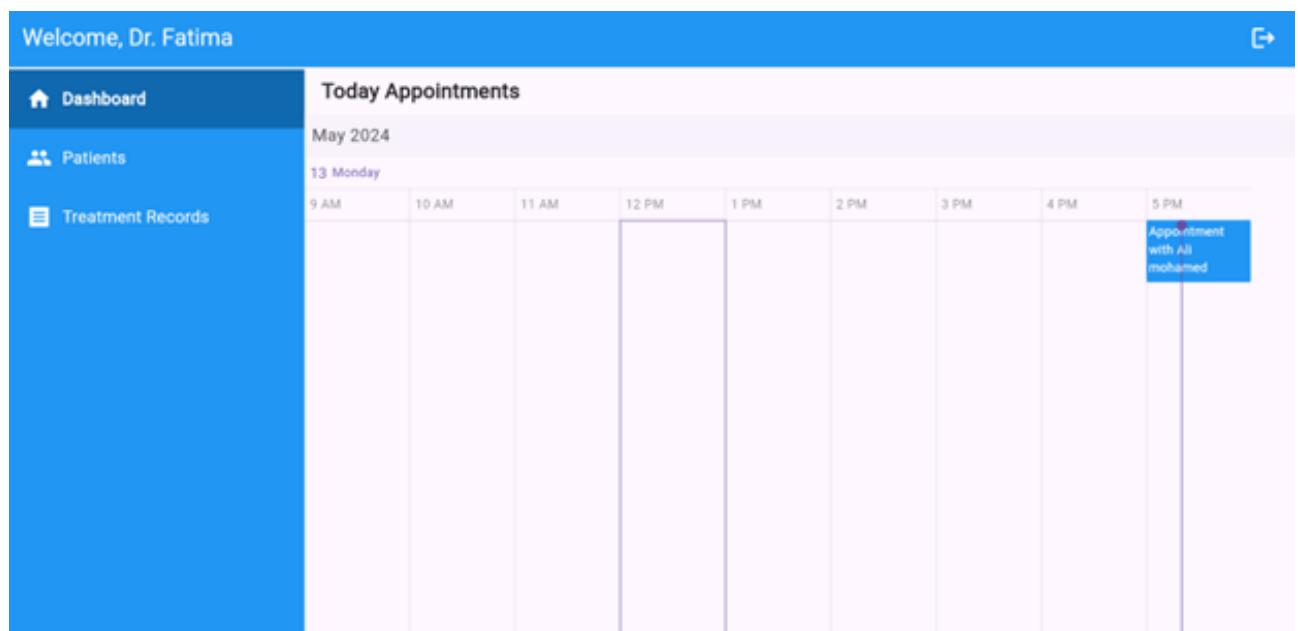


Figure 6.33 Dentist Home Page

### 6.2.10.2 Patient List Page

The screenshot shows a mobile application interface for a dental practice. At the top, a blue header bar displays "Welcome, Dr. Fatima" on the left and a share icon on the right. Below the header is a navigation sidebar with three items: "Dashboard" (with a house icon), "Patients" (with a people icon, currently selected), and "Treatment Records" (with a list icon). The main content area has a light pink background. It contains a search bar with the placeholder "Search" and a list of patient entries. Each entry consists of a name and a unique ID. The entries are as follows:

- hasan ali  
011012920
- Ali mohamed hasan  
020709773
- mohamed isa hasan  
040203263
- Mohamed isa hasan  
020709221
- Ali Husain  
011012921

Figure 6.34 Patient List Page

The dentist can access patient information similarly to the admin and receptionist but with restricted access to their interfaces. The dentist cannot add new patients but can only search for existing ones.

### 6.2.10.3 Treatment Record Page

The screenshot shows a mobile application interface for a dental practice. At the top, a blue header bar displays "Welcome, Dr. Fatima" on the left and a share icon on the right. Below the header is a navigation sidebar with three items: "Dashboard" (with a house icon), "Patients" (with a people icon), and "Treatment Records" (with a list icon, currently selected). The main content area has a light pink background. It contains a section titled "Treatment Records" which lists a single record. The record details are as follows:

Tooth Extraction  
2024-04-27  
020709773

Next to the record, there is a small edit icon (a pen symbol) and a plus sign (+) icon, likely for adding new records.

Figure 6.35 Treatment Record Page

When the user clicks on "Treatment" in the side menu, a page will be displayed showing a list of treatment records. Each record will have a pen icon, allowing the user to edit it, and there will be an addition icon for adding new records.

#### 6.2.10.4 Treatment Record Details Page

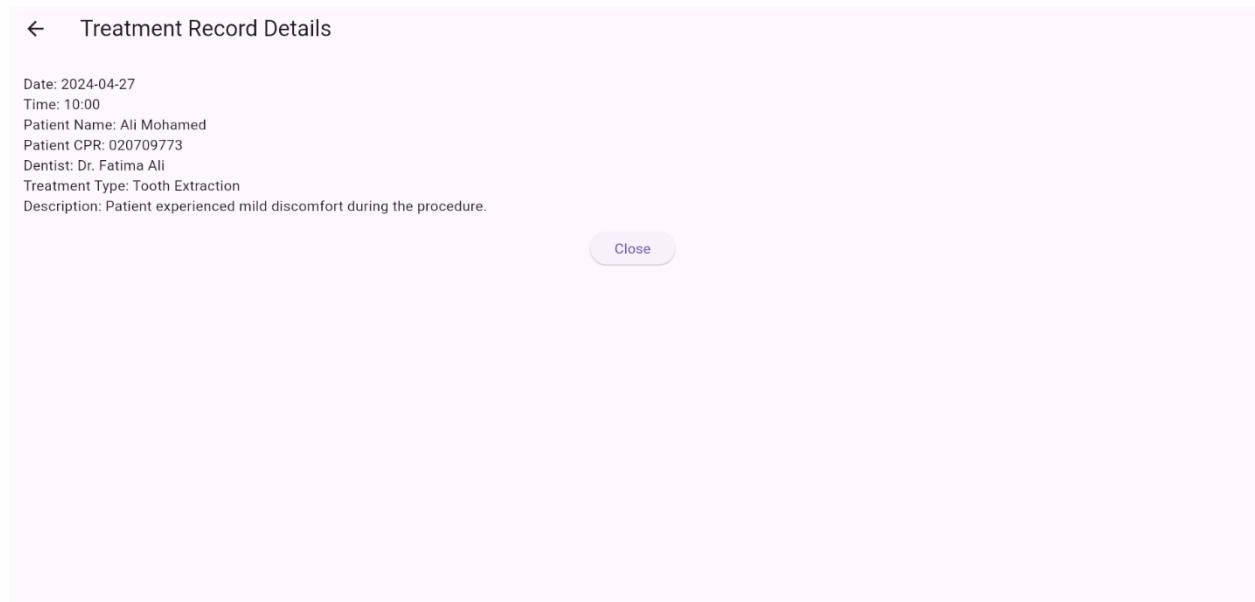


Figure 6.36 Treatment Record Details Page

When the user clicks on a treatment record, this page will be displayed, showing the details of the treatment record.

#### 6.2.10.5 Edit Treatment Record Page

The screenshot shows a mobile application interface for editing a treatment record. At the top left is a back arrow icon followed by the text "Edit Treatment Record". Below this are input fields for the following information: Date (2024-04-27), Time (10:00), Patient Name (Ali Mohamed), Patient CPR (020709773), Dentist (Dr. Fatima Ali), Treatment Type (Tooth Extraction), and Description (Patient experienced mild discomfort during the procedure). There is also a section labeled "Attachments". At the bottom right is a "Save Changes" button.

Figure 6.37 Edit Treatment Record Page

When the user clicks on the pen icon, they can easily modify the treatment record.

#### 6.2.10.6 Create Treatment Record Page

← Add Treatment Record

Date  
2024-05-13

Time  
17:21

Patient Name

Patient CPR

Dentist  
Dr. Fatima

Treatment Type

Description

Attachments

Cancel Add

Figure 6.38 Create Treatment Record Page

When the user clicks on the addition icon, the system will display the user's name and the current time. The user can then enter the treatment details and attach documents such as X-rays and other important information that should be stored in the clinic database for reference.

## 6.2.11 Receptionist Screens

### 6.2.11.1 Receptionist Home Page

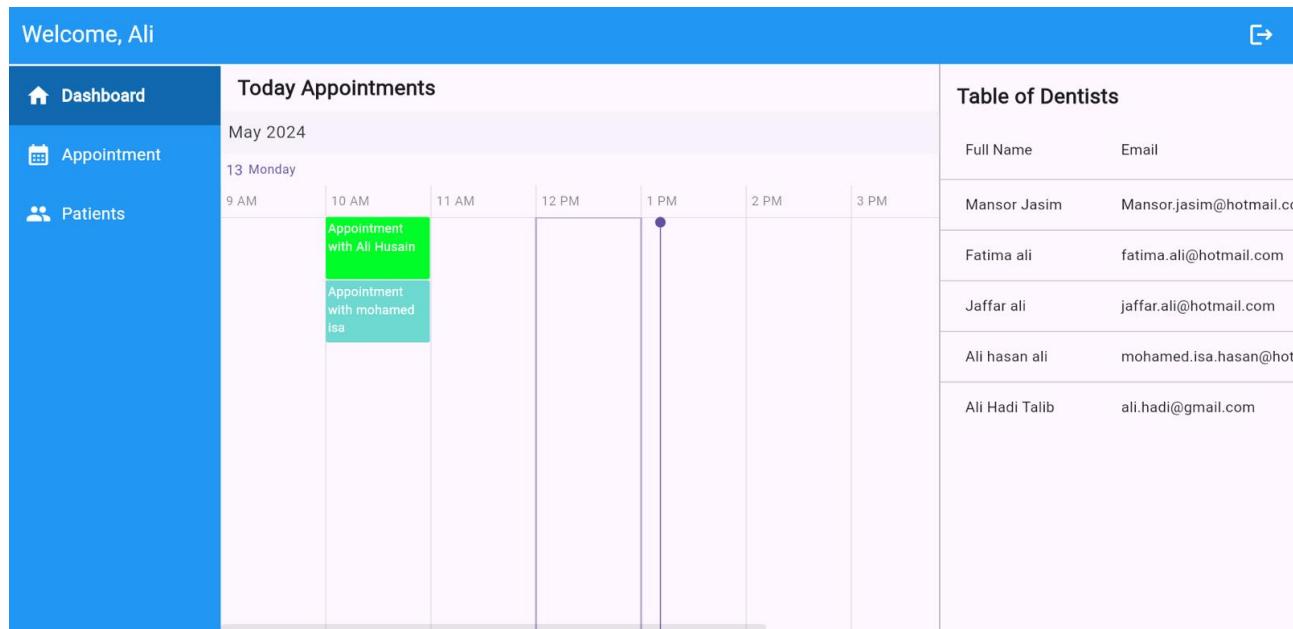


Figure 6.39 Receptionist Home Page

After login into the system, the receptionist is directed directly to the Home Page. The dashboard has a complete list of all the dentists who are currently in practice at the clinic, along with their email addresses. It also has a calendar with the appointments for the current day shown, including dental appointments that are color-coded. Determining peak hours is made easier with the help of this organizational method. A sidebar menu also provides quick access to other system components, such the patient page and other pages.

### 6.2.11.2 Appointments Page

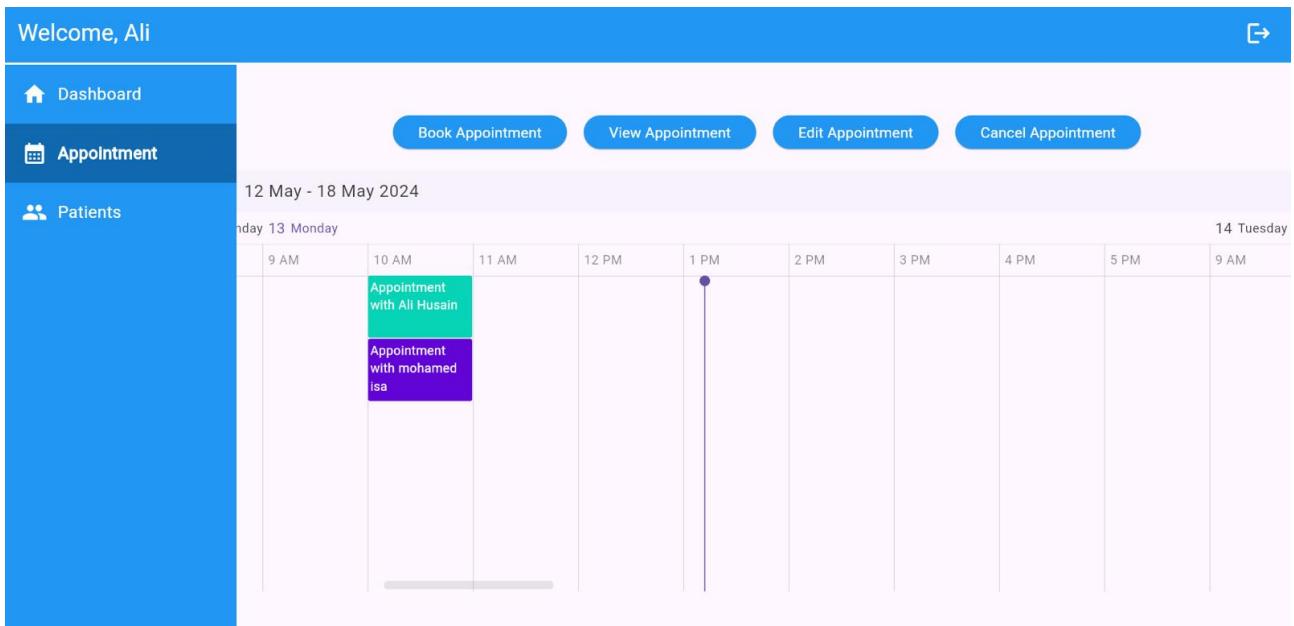


Figure 6.40 Appointments Page

Similar to the admin page, the appointment page has a calendar that is set to the current week and shows appointments for that time range. The receptionist has simple access to the clinic's appointment scheduling and administration features with the four buttons—book appointment, view appointment, edit appointment, and cancel appointment—prominently displayed on this page.

### 6.2.11.3 Patients List Page

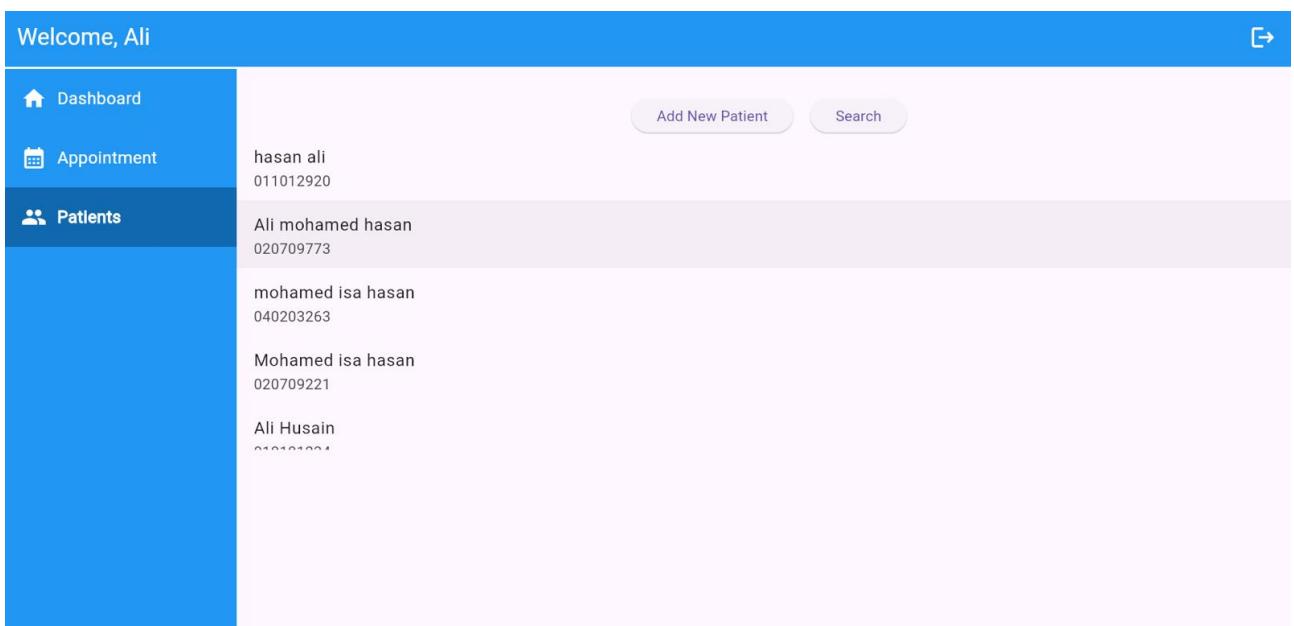


Figure 6.41 Patient List Page

The patient page will open when the receptionist chooses the "Patient" option from the side menu, just like the admin page. All of the patients listed on this page, along with their names and CPR numbers, are kept in the clinic database. Two more options are available: one to search among the patients who are currently on the list, and another to add new patients.

### **6.3 Testing strategies:**

From GeeksforGeeks. (2023, December 6) Software delivery is becoming increasingly important, needing continuous testing throughout the design process. This approach includes preliminary testing, development, production, and end-user validation. Modern testing tools and frameworks boost efficiency and coverage while instilling a quality culture in development teams. This strategy not only saves time and effort when detecting and correcting problems, but it also improves software reliability and efficiency.

### 6.3.1 Unit Testing

Unit testing is the process of testing that the smallest part of software that can be tested is working correctly. It guarantees the proper operation of particular software modules. Here are a few of the Dental Clinic System's most important testable elements.

Test No.	Test Case	Expected Result	Actual Result
1	User Enters Wrong Password When Signing In	A message alert telling the user to the problem.	A message in the alert box about an invalid credential.
2	The patient enters incorrect characters in their phone number when registering.	A message alert telling the user to the problem	An alert box indicating the incorrect text format
3	The patient enters incorrect CPR Invalid characters when registering	A message alert telling the user to the problem.	An alert box indicating the incorrect text format
4	When signing up, the patient enters an existing email address.	A message alert telling the user to the problem	An alert box indicating that the email already exists.
5	Patient enters an existing CPR when signing up	A message alert telling the user to the problem.	An alert box indicating that the CPR already exist.

Table 6.1: Unit Testing

### 6.3.2 Function testing

From GeeksforGeeks. (2023, December 6a) Function testing is a type of software testing where the functionality of the software system is compared to the requirements and specifications. By giving appropriate input and comparing the outcome to the functional requirements, functional tests are intended to confirm that each software application function is operating as intended.

In our functional testing we have focused on a crucial aspect which is 'book appointment', that if the patient select a dentist then it is going to display available the dates and if the date is selected it is going to display the time for that date but if the patient did not select any dentist it is not going to display the date.

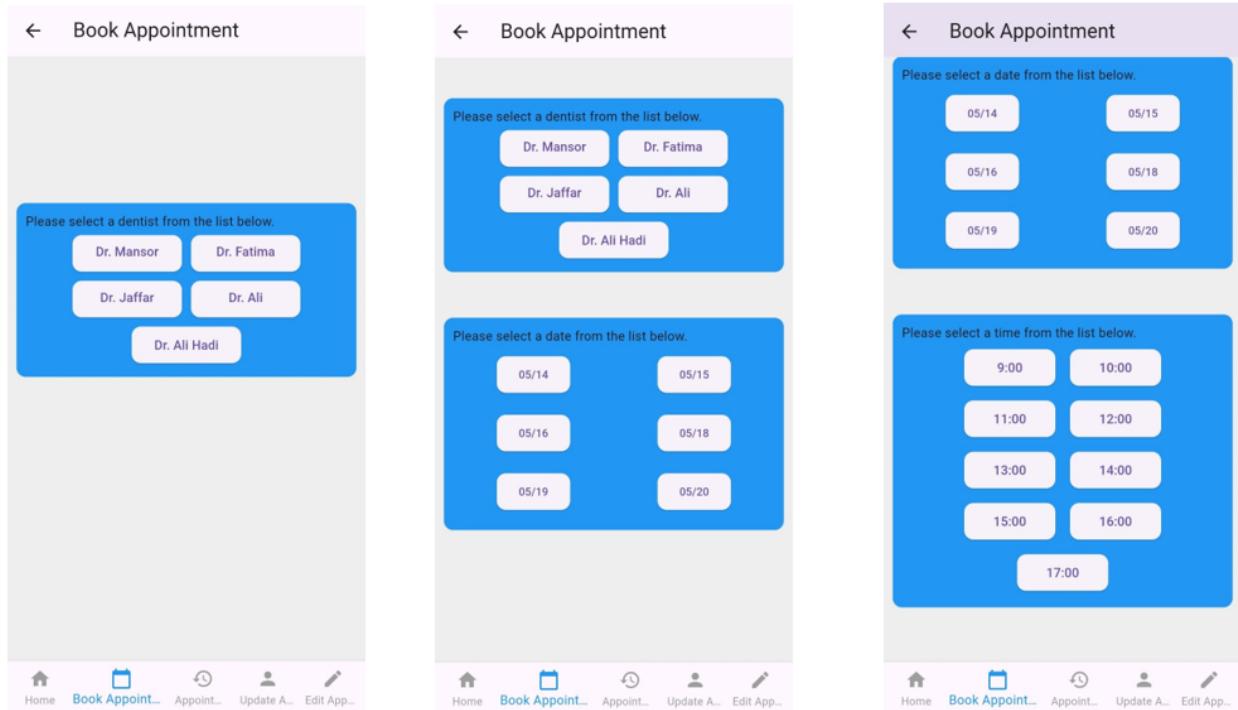


Figure 6.42 Testing Functionalities

### 6.3.3 Integration testing

Integration testing is a critical step in software development that confirms the functionality of different components or features. It focuses on verifying the interactions between these components to make sure the system functions cohesively. The patient entered their data in

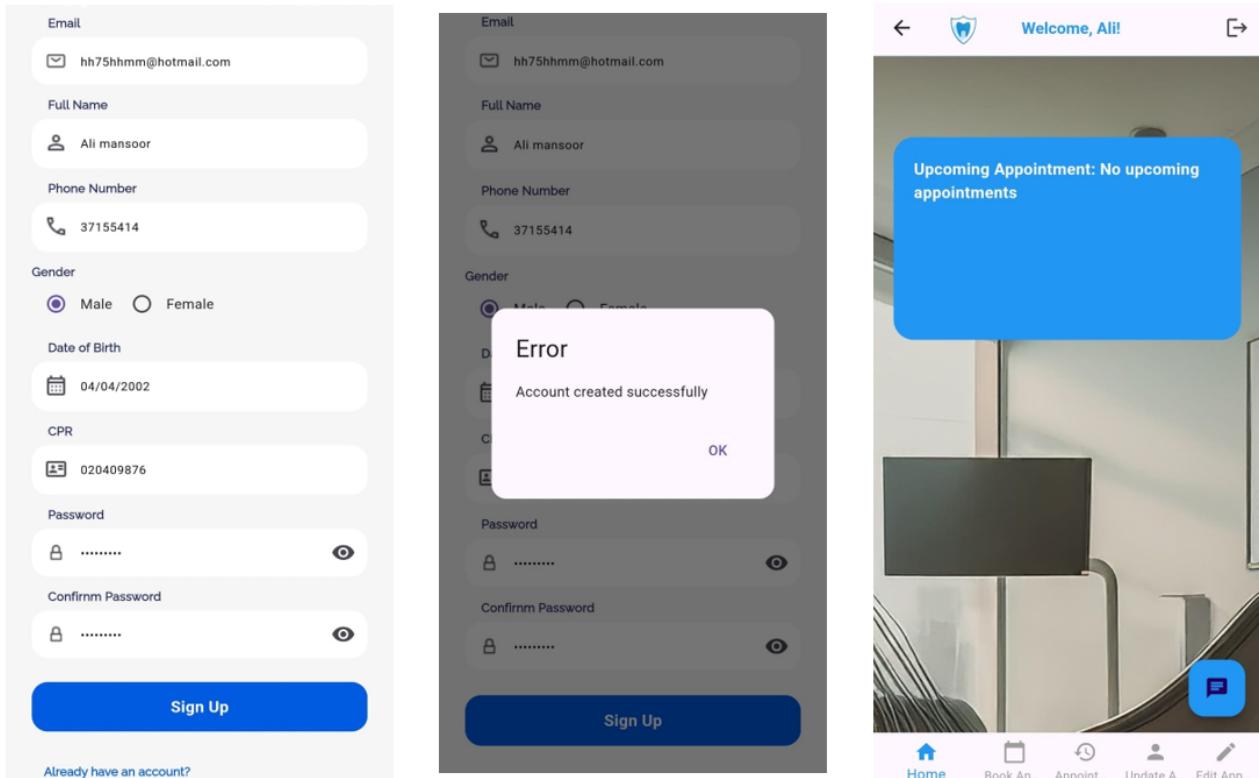
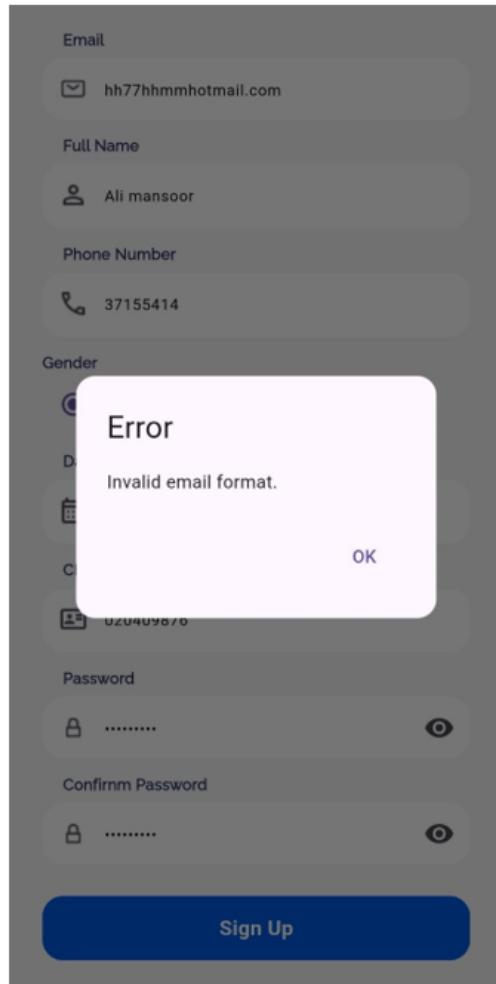


Figure 6.43 Integration testing (Creating Account)

the first stage shown in the image, starting the creation process by giving necessary information. When the patient clicks "Sign Up," an alert stating that their account was successfully created appears, taking them to the main page.

#### 6.3.4 Integration testing

Validation testing is the process of verifying the accuracy of the data entered, making sure that no wrong data type has been entered and kept in the database, preventing server errors, and maintaining data consistency.



The email validation process is completed in the above figure. The patient enters his email address into registration, and the software uses regular expression to validate the information after it has been received. The user receives an error message stating that the email's data field is invalid as soon as the software detects that it does not match the format of the email.

## Chapter 7

# Conclusion and Future Work

### 7.1 Conclusion

As we draw this project to a close, it's essential to reflect on its purpose and journey. Our project was built with the aim of enhancing the efficiency of dental clinic appointments management and providing a flexible system for monitoring various aspects of clinic operations, including patient management and appointment scheduling. Our goal was to ensure a smooth and efficient experience for patients. Our project followed a structured software development lifecycle, beginning with the collection and analysis of requirements. We carefully gathered insights from both the clinic's perspective and the patient's perspective, understanding the needs of stakeholders such as dentists, receptionists, system administrators, and patients. This comprehensive understanding guided us in designing a system that caters to the unique requirements of a dental clinic environment. Throughout the development process, we prioritized functionality and quality, striving to deliver a dental clinic system that meets the highest standards. Drawing inspiration from existing dental clinic software, we used industry best practices while incorporating innovative features to set our project apart from the competition. The implementation phase saw our designs transformed into a functional, coded version of the system. We tested each aspect of the system, utilizing various testing methodologies to ensure alignment with the initial requirements. Our goal was not only to build the right system but also to validate that it meets the needs of dental practitioners and patients alike. It's worth noting that our project utilized a diverse range of software and hardware tools, enabling us to create a robust and reliable solution. As we approach the culmination of this endeavor, we are proud to have developed a comprehensive dental clinic management system that empowers dental professionals to streamline their operations and deliver exceptional care to their patients.

### 7.2 Limitation and Future work

The important needs have been well implemented, although certain features were left out of the finished product because of difficulties we encountered. running out of time and some features that demand payment for specific vendors' components. to include that requirement in our Dental Clinic System. Those features have not been forgotten, and they will be included and implemented into the project in the future when the proper time presents itself. Functionalities that we wish we had time to make:

1. Chatbot
2. Notifications
3. Virtual Diagnosis

Some of the limitation:

1. There weren't many references of similar systems.
2. All our members were busy with other courses.
3. We took the project in one semester, so we were pressed on time.

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