An-Najah National University

Faculty of Engineering & Information Technology

Computer engineering department

Graduation project 2

Diabetes companion

رفيق السكري

Accomplished by:

Farah Touqan

Arzaq Doudar

Supervisor:

Dr. Emad Natsheh

presented in partial fulfillment of the requirements for Bachelor degree in Computer Engineering

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Acknowledgment

We would like to take this opportunity to express our deepest gratitude to the individuals who have been instrumental in the completion of our graduation project.

First, we extend our heartfelt appreciation to our supervisor Dr. Emad Natsheh. This project has been influenced by his expertise, mentorship, and continuous guidance. We appreciate his patience, constructive feedback, and commitment to our academic development.

To Dr. Jenan Al Sha'er, who voluntarily gave their time and knowledge for this research, we would like to convey our thanks. Their participation has been essential in obtaining important information and understandings that have facilitated our research.

We are grateful to our families and friends for their inspiration and support. Our motivation has come from your support.

Lastly, we extend our gratitude to all those who have contributed in any way to the completion of this project. Your contributions have impacted our personal and academic growth, and we will carry the lessons learned from this project with us into our future endeavors.

Disclaimer

This application was accomplished by Farah Touqan and Arzaq Doudar from the Computer Engineering Department at An-Najah National University for educational purposes only, and the Department of computer engineering at An-Najah National University does not share the writers' opinions, which are their own. The content, features, and functionality presented in this application are based on our skills and knowledge at the time of completion.

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First chapter

1. Introduction

1.1 Statement of the problem

Diabetes is a common long-term health condition that affects many people worldwide. It requires careful management of blood sugar levels, taking medication as prescribed, and making lifestyle changes. However, managing diabetes can be challenging for many people due to limited access to healthcare, lack of personalized guidance, and difficulty in keeping .track of important health information

This graduation project aims to tackle these challenges by creating a new mobile app for diabetes management. The app will have a simple and user-friendly design that allows individuals with diabetes to track their blood sugar levels, take their medication on time, calculate the carbs in their meals, and know how much medication they should take. It will also include features to help users find nearby stores or restaurants that offer food suitable for their dietary needs, connect with healthcare experts, and get reminders for medication .doses

1.2 Objectives

Through the development of this diabetes management application, our goal is to help people with diabetes gain more control over their health, improve their ability to take care of themselves and enhance their overall well-being. We want to make it easier for healthcare providers and patients to communicate, monitor health progress, and work together to manage diabetes more effectively. This graduation project aims to contribute to the field of digital health technology and make a positive difference in the lives of individuals .with diabetes, enabling them to lead healthier and more fulfilling lives

1.3 Significance or importance of your work

The importance of this graduation project is that it can make a big difference in the lives of people with diabetes. Diabetes is a long-term condition that requires ongoing care and looking after yourself. The app we're developing has a user-friendly design and many helpful features. It allows people with diabetes to easily keep track of their blood sugar levels, take .their medication on time, and know how many carbs are in their meals
Moreover, the app includes reminders to help users remember important things, like taking their medication or checking their blood sugar. It also lets them connect with their healthcare providers, so they can communicate easily and get their needed support. The app .even helps users find nearby stores that sell food suitable for their dietary needs
All these features are meant to support people with diabetes in managing their condition better. By using the app, they can stick to their medication and diet plans, have better communication with their healthcare providers, and find suitable food options more easily. .This can lead to improved outcomes and a better quality of life for people with diabetes
Overall, this project is significant because it has the potential to positively impact the lives of people with diabetes. It helps them take better care of themselves and provides a platform .for further advancements in digital health technology

1.4 Report organization

In Chapter 2 Constraints, Standards, and Earlier Coursework, we will talk about the limitations faced while working on this project as well as how past coursework aided in its completion.

In Chapter 3 Literature Review, we will discuss similar research and other works related to the project.

In Chapter 4 Methodology, we will discuss how the project has been built and the tools used to build the project.

In Chapter 5 Conclusion and Discussion, we will give a summary of the project and what we have learned from the process of creating it and highlight some improvements that are future work.

Second chapter

2. Constraints, Standards, and Earlier Coursework

2.1 Constraints and Limitations:

Data and Requirements collection: Finding someone to provide us with genuine data was a challenging procedure, but it is crucial to understanding the needs of individuals with diabetes and the difficulties they encounter. This difficulty was resolved once we encountered a sick person and obtained his requirements and true data from him.

Medical and Technical Data: medical and technical information about diabetes management is critical to make sure the app works well and gives accurate results. This can involve collecting data about checking blood sugar levels, taking medication as prescribed, and following dietary guidelines. Having all this information helps us create a useful and effective app for managing diabetes.

2.2 Standards:

Client Server Model:

The project is divided into three tiers as the following:

- **Client:** The mobile application shows the user what they see on the screen. It asks the backends for certain functions and displays the outcome on the GUI. The app was created using Flutter.
- **Server:** It is written using Node js. It handles behind-the-scenes operations, like sending requests to the database and responding to requests from the GUI.
- **Database:** The application is built using a MongoDB database and a ngrok server. It handles the requests that come from the back-end server and serves the appropriate responses.

diabetes_companion

LOGICAL DATA SIZE: 8.08KB STORAGE SIZE: 272KB INDEX SIZE: 308KB TOTAL COLLECTIONS: 8

Collection Name	Documents	Logical Data Size	Avg Document Size
admins	1	102B	102B
advice	5	910B	182B
carbs	24	2.33KB	100B
doctors	2	268B	134B
glocoses	14	1.88KB	138B
my_doctors	6	946B	158B
patients	3	1.06KB	364B
stores	4	656B	164B

Figure 1: Database

2.3 Earlier Coursework:

We received valuable support from the Computer Engineering Department's courses, including Web, Database, Software Engineering, Object-Oriented, and Critical Thinking. These courses provided us with the necessary knowledge and skills to develop the project. Additionally, we took other courses like Flutter and NodeJS classes to gain expertise in specific technologies needed for the project.

Third chapter

3. Literature review

The use of mobile applications has gained popularity in recent years as a promising approach to assist individuals with diabetes in managing their condition effectively.

To the best of our understanding, there doesn't appear to be any other local application similar to the diabetes app we have developed. However, this app incorporates a wide range of features taken from various existing applications and combines them into a single, comprehensive application.

After our interviews with Dr. Janan Al-Shaer, she shared a bunch of websites and applications that deal with diabetes. Among these websites, the most important was the American Diabetes Association website. We found a lot of useful information and learned more about diabetes from it.

And about applications, the ‘CalorieKing’ application holds the benefit of accurately determining the carbohydrate quantity within a meal, whereas the ‘Carb Master’ application excels in calculating carbohydrates and providing the precise insulin dosage suitable for that particular meal. Meanwhile, the ‘GlucoseBuddy’ application grants users the capability to access their medical reports spanning a designated time frame. All these functionalities have been integrated into our project.

Fourth chapter

4. Methodology

4.1 Research design and data collection:

Through conducting interviews with individuals who have diabetes, we collected valuable insights in order to gain a better understanding of their unique requirements and the difficulties they face. We also collected data about carbohydrates in the main meals by Dr. Jenan Al Sha'er, and here are some tables of this.

الفطور :

الصنف	الوزن (غم)	الكاربوهيدرات (غم)
خبز أبيض	30	15
خبز اسمر	30	15
خبز توست	30	15
خبز حمام	30	15
خبز هامبرغر	خبز دائري 1/2	15
حمص(حمص بالطحينية)	كوب أو 2 ملعقة كبيرة 1/3	15
فلافل	حبات وسط او 45 غم 3	15
فطاير بالسبانخ	حبيبة صغيرة أو 45غم	15
فطائر زيت وزعتر	غم 35	15
فطاير بالجبنة	غم40	15
فطائر بطاطا	غم45	15
عسل	ملعقة كبيرة1	15
مربى	ملعقة كبيرة1	15
باذنجان مقلي	كوب مقطع 1	15
دقيق ذرة	ملاعق كبيرة3	15

Table 1: Carbohydrates breakfast

الغداء :

الصنف	الوزن	الكربوهيدرات
برغل	كوب مطبوخ1/2	15
أرز حبة قصيرة	كوب مطبوخ1/3	15
أرز حبة طويلة	كوب مطبوخ1/2	15
مقلوبة باذنجان	كوب1/2	15
مقلوبة بطاطا	كوب1/3	15
مقلوبة الزهرة	كوب1/2	15
مسخن	غم خبز وبصل50	15
سبانخ	كوب1	10
ملوخية	كوب1	10
دجاج محشي	اي كمية دجاج+1/3كوب ارز	15
ملفوف	حبات متوسطة4	15
كوسا او باذنجان محشي	حبة صغيرة2	15
محشي بطاطا	حبة صغيرة1	15
دوالي	حبة وسط6	15
شوربة عدس	كوب مطبوخ 1/2	15
شوربة فريكة	كوب مطبوخ(1/2فريكة ,1/2 مرقة1	15
فتة المكدوس	كوب3/4	15

Table 2: Carbohydrates lunch

الحليب ومشتقاته :

النوع	الوزن	الكربوهيدرات
الحليب	كوب يحتوي على 240 مل 1	12
لبن رائب	كوب 1	18

Table 3: Carbohydrates milk and dairy products

الوجبات الخفيفة :

الصنف	الوزن	الكربوهيدرات
فتوش	كوب1	12
سلطة الخيار باللبن	كوب1/2	12
بطاطا حلوة	كوب1/2	15
بوشار	اكواب3	15
ذرة	كوب او 1/2كوب ذرة وسط1/2	15
تبولة	كوب1	10
حمص بليلة	كوب مطبوخ1/2	15
فول مسلوق	كوب مطبوخ 1/2	15
ترمس	كوب مطبوخ 1/2	15

Table 4: Carbohydrates snack

الوجبات السريعة :

الصنف	الوزن	كربوهيدرات
قطع دجاج نغتس	أصابع 6	15
بطاطا مقلية	غم او 10 اصابع30	15
برغر	عادي1/2	15
ساندويش هوت دوغ	ساندويش 1/2	15
بيتزا جبنة	غم او 1/8 قطعه الكاملة45	15
بيتزا لحمة	غم او1/8قطعه الكاملة45	15
شنيتسل	قطعه واحدة او 90غم	15
شاورما	رغيف 125غم بدون بطاطا	62

Table 5: Carbohydrates fast food

العصائر :

الصنف	الوزن	الكربوهيدرات
تفاح	حبة وسط1	15
عصير الفاكهة	كوب1/2	15
تفاح مجفف	حلقات4	15
مشمش	حبات صغيرة4	15
موز	حبة صغيرة جدا او 70غم1	15
بطيخ	شرحة او 1كوب مقطع1	15
كرز	حبة 12	15
زبيب	معلقه كبيرة2	15
جريفوت	حبة12	15
عنب	حبة12	15
مانجا صغير	حبة او1/2كوب مقطع1/2	15
كيوي	حبة كبيرة1	15
كلمنتينا	حبة صغيرة2	15
تمر او بلح	حبات وسط 3	15
صبر	حبة وسط2	15
جوافة	حبة وسط1	15
اسكدنيا	حبات وسط5	15
بوملة	حبة1/2	15

Table 6: Carbohydrates juices

الحلويات :

الصنف	الوزن	الكربوهيدرات
جلي	كوب1/2	15
بودينغ	كوب1/4	15
شوكلاته	غم20	15
قطر	معلقة كبيرة1	15
بوظة	كوب1/2	15
قدرة قادر	30	15
ليزي كيك	35	15
كنافة بالجبنة	غم60	15
معمول	حبة1	15
أرز بالحليب	كوب1/3	15
ليالي لبنان بدون قطر	قطعه1	15
هريسة	قطعه1/2	15
غريبة	حبة2	15
حلبة	غم15	15
بقلاوة	(حبة15غم الحبة2	15
سحلب	كوب1/2	15
شيبس	رقيقة 16	15

Table 7: Carbohydrates sweets

المأكولات التي لا تحتوي على كربوهيدرات:

زيت الزيتون	زبدة الفول السوداني	افوكادو	طحينية
لبنة	جبنة	الزعتر	البيض
بزر الكتان	الأسماك بأنواعها	اللحوم بأنواعها	الدجاج
لحمة الحبش	الزيتون	الشمينت	كفتة بطحينية بدون بطاطا
كفتة ببندورة بدون بطاطا	المكسرات بأنواعها	الزيتون بأنواعها	الشاي بدون سكر

Table 8: Carbohydrates food that does not contain carbohydrates

Furthermore, to evaluate how user-friendly and effective our mobile application is in helping individuals with diabetes manage their condition, we carried out usability testing. This entailed inviting a person with diabetes to use the app and provide his feedback on how easy it is to use and how it impacts his diabetes management.

4.2 Tools, Methods, and Programming Languages:

4.2.1 Client side:

- **Design:**
  Selecting the design was a difficult task as we wanted it to be user-friendly and visually appealing. Our process began with carefully choosing a color scheme that would be pleasing to the eye. We then proceeded to merge colors and design sketches, crafting interconnected interfaces that offer a seamless and effortless user experience. Additionally, we made sure to offer the app in Arabic to make it easier for local users.

- **Programming languages:**
  The client-side programming language we utilized is Dart, an object-oriented programming language developed by Google. Dart is comparable to C++, Java, and JS, and we found it to be convenient to work with due to our prior experience with similar languages. We selected Dart for a few reasons, and one of them is the large number of libraries available. These libraries make it easier to write scripts and improve the efficiency and user-friendliness of the programming process.

4.2.2 Server side:

To enhance the system's functionality, we implemented a client-server architecture, where multiple clients (remote processors) interact with a centralized server (host computer). Clients serve as interfaces through which computer users can request services from the server and display the results obtained from the server. It's important to note that all clients will be utilizing the same API to ensure consistency and compatibility.

- **Frameworks:**

  A Node JS framework was chosen for server-side functionality.

4.2.3 Website:

In addition to the mobile application, we also developed a website dedicated to diabetes. This allows users to have two options for processing their complaints: they can either use their phones or visit the website.

- **Programming languages:**

  we use HTML and CSS languages to make the admin user pages

4.3 Database Design:

Developing a mobile application or creating a website requires creating an appropriate database that saves and stores everything, as we are dealing with real-life problems, we need a database that provides great flexibility to the fields in the documents and it provides high performance, availability, and scalability.

The MongoDB database was chosen for the previous reasons mainly.

4.4 Ethical Considerations:

We get permission from the participants and ensure their privacy and confidentiality.

4.5 System Features and Design:

This system contains many screens all combined together in a user-friendly design that will smoothen the process for users.

Below are some pictures attached:

Figure 2: first screen

This is our first page in this application

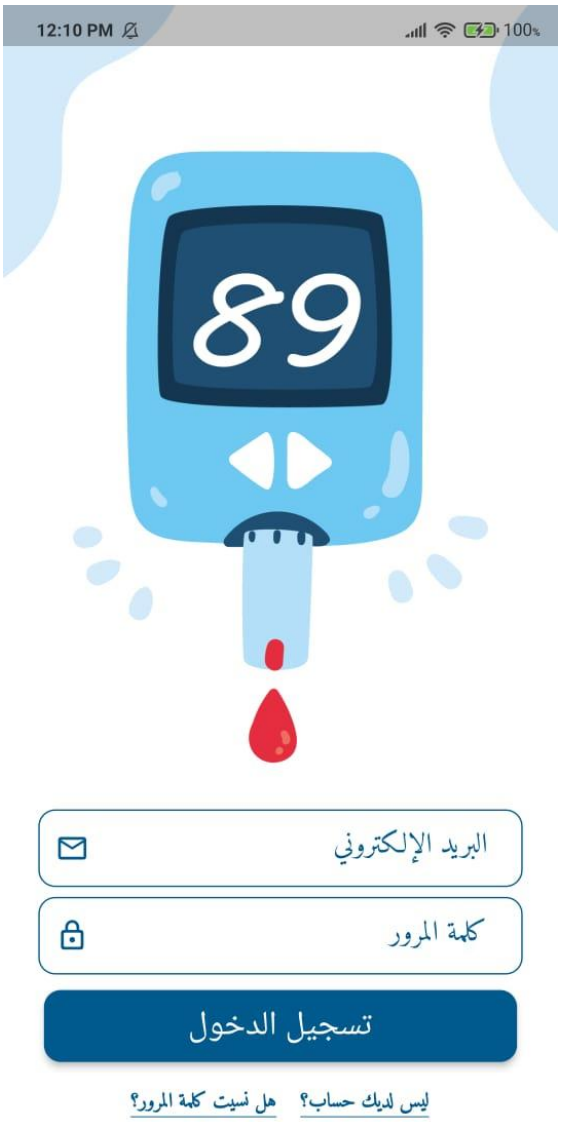


Figure 3: Login page

Here’s the login page, he can put his email and password.

Figure 4: signup page

Here’s the signup page, he can put his basic information.

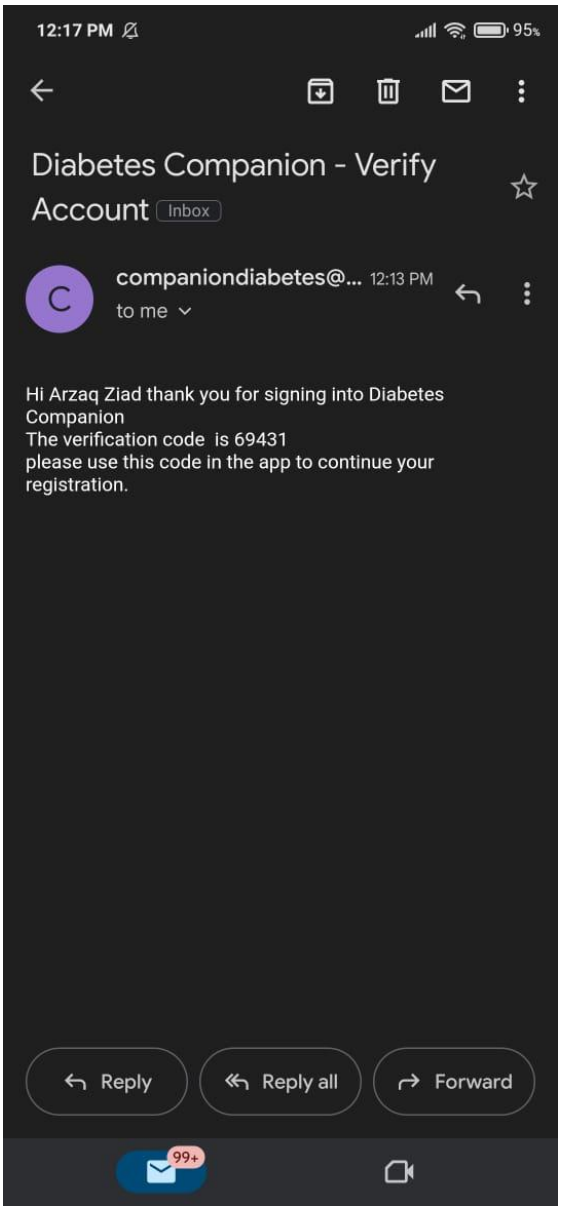


Figure 5: verification after signup

Here’s the email that reaches the user after signup to verify his email.

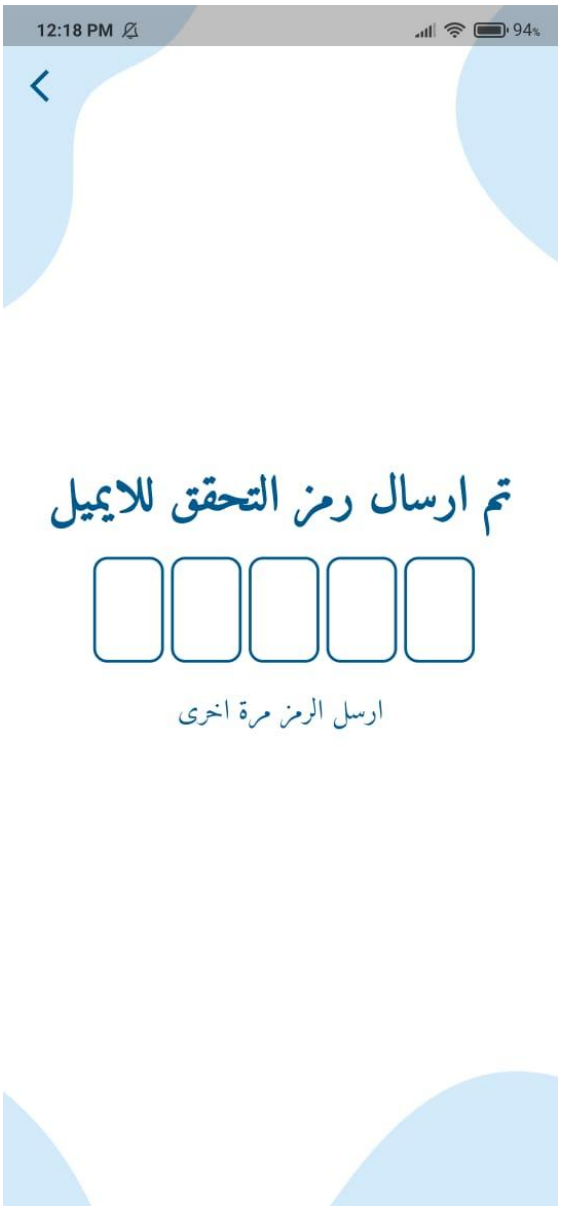


Figure 6: Code page

Here’s the verification code page.

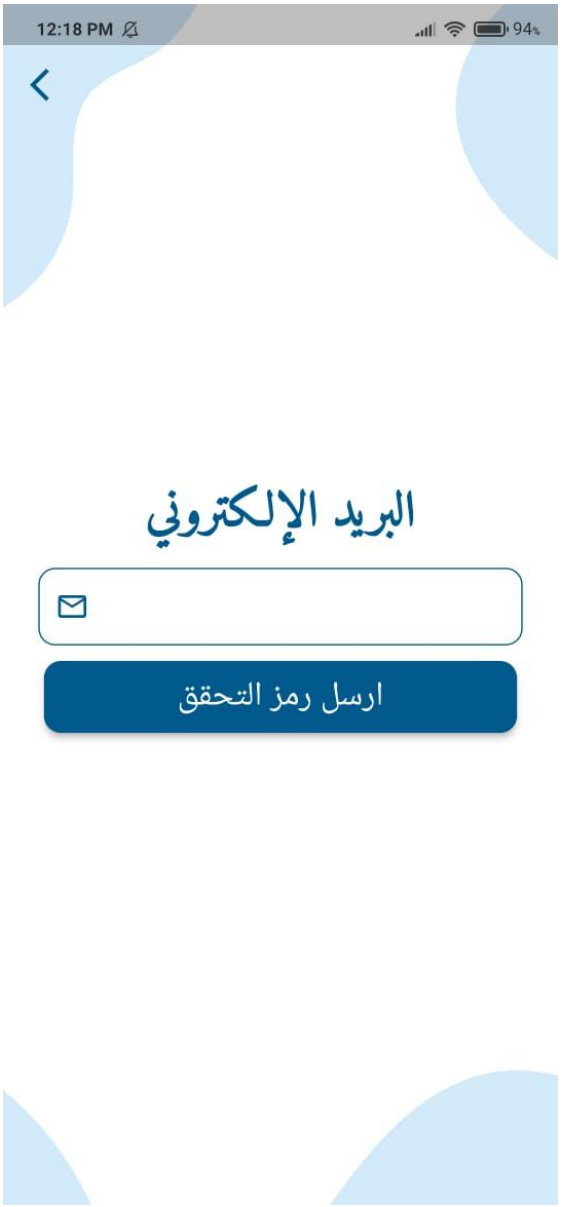


Figure 7: email verification page

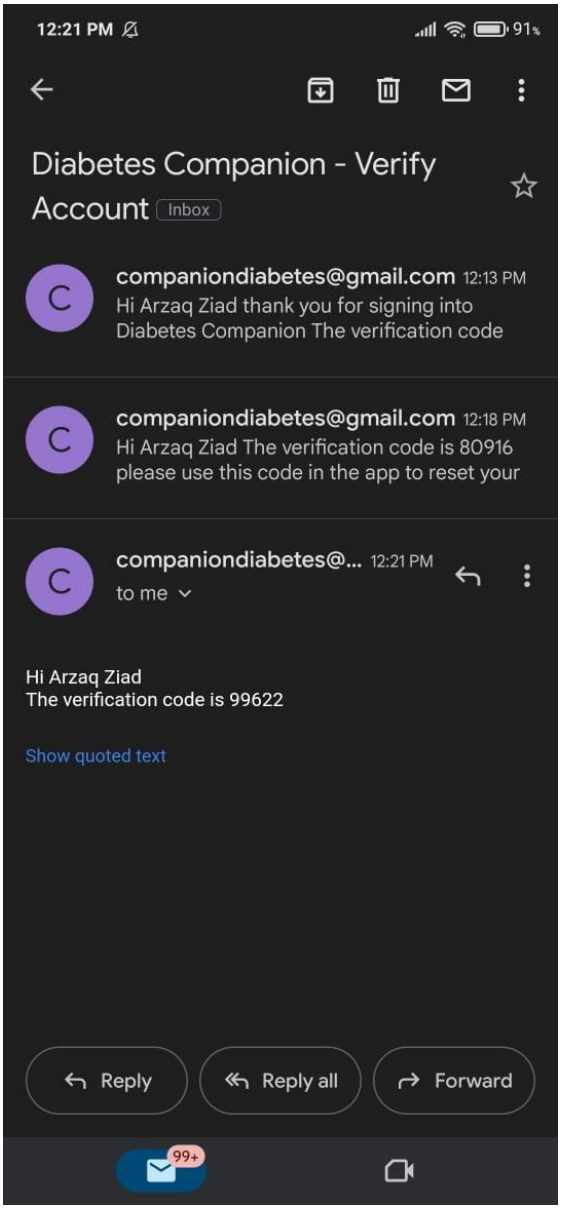


Figure 8: Verification code for email

If the user forgets his password he can reset his password and he can enter his email to send a code to it.

Here's the verification code that reaches the email.

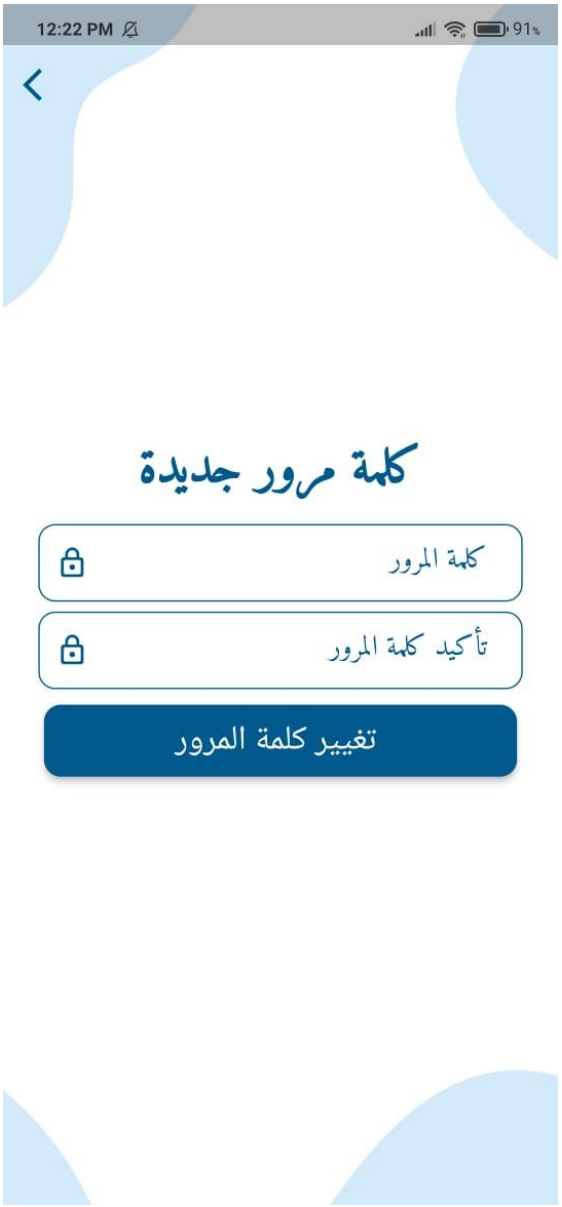


Figure 9: Reset password

If the user forgets his password he can reset his password.

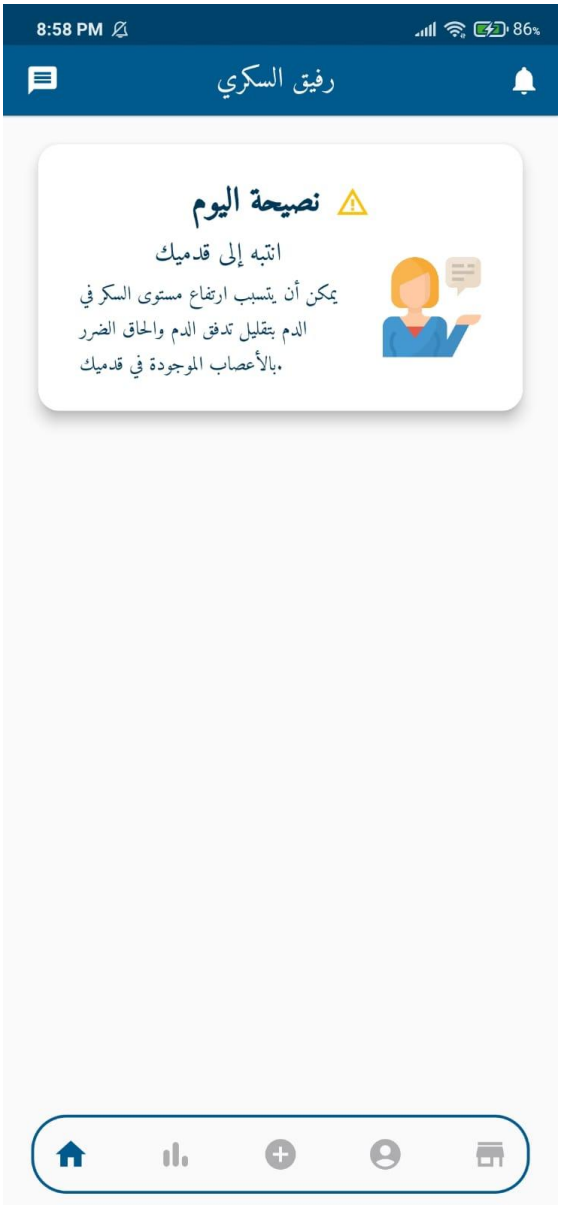


Figure 10: Home page

Here's the home page, there are several tips given to the patient.

Figure 11: personal page

On this page, the patient has the ability to modify their profile information, view his scheduled appointments, and access information about the doctors overseeing their care.

Figure 12: personal page 2

Here he can see his personal information, but in this image, he did not enter this information.

Figure 13: edit personal information page

On this page, the patient has the ability to modify his basic information as we can see in the image.

Figure 14: personal information

After he edits his information, he can see this on his profile page.

Figure 15: doctors page

On this page, the patient can see his doctors and add any doctor he wants.

Figure 16: add new doctor

On this page, he can add the doctor he wants and put his information.

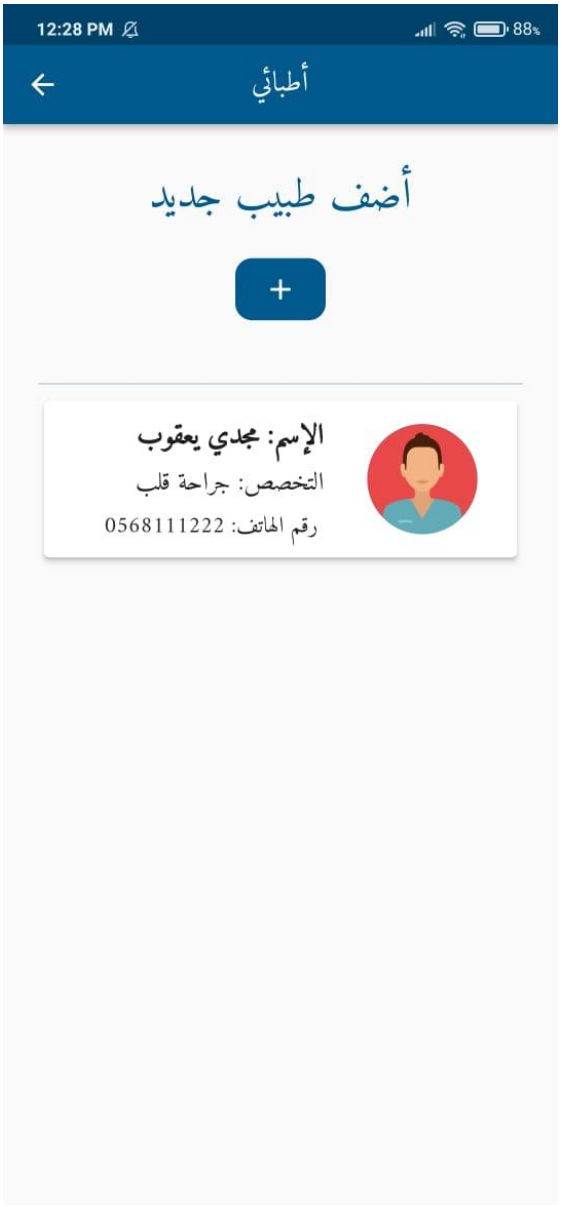


Figure 17: doctors page

After he adds the doctor, he can see him on the doctor's page.

Figure 18: messages page with QRcode

This is the messages page, if the doctor doesn’t add the patient he can’t message him.

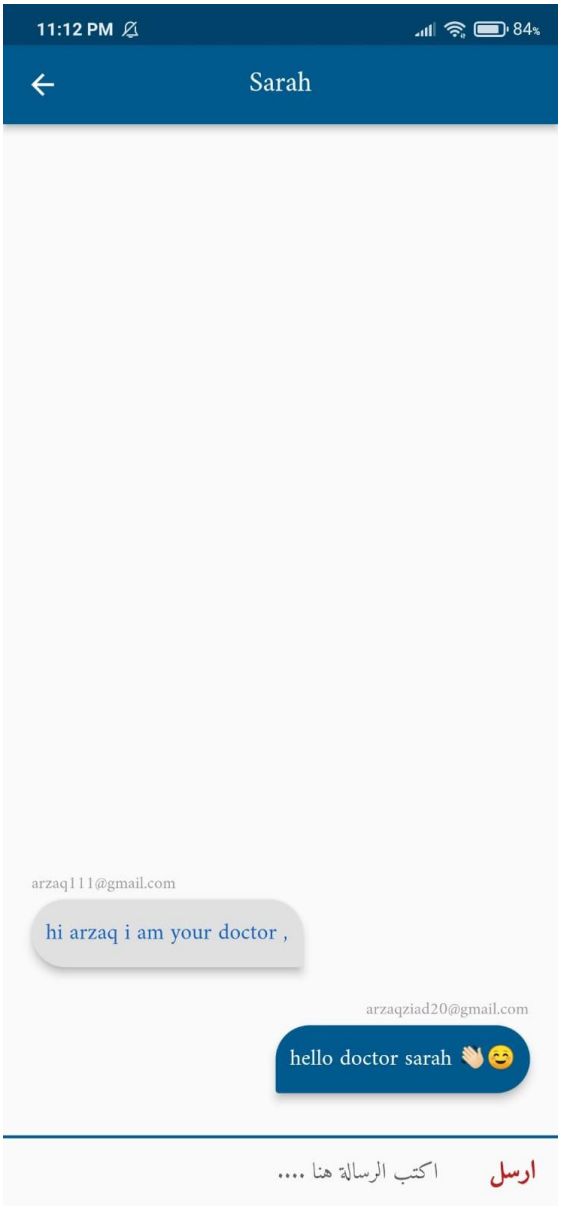


Figure 19: messages page

After the doctor adds the patient he can talk with him, and the doctor can use the patient's QRcode to start the conversation as in the previous image.

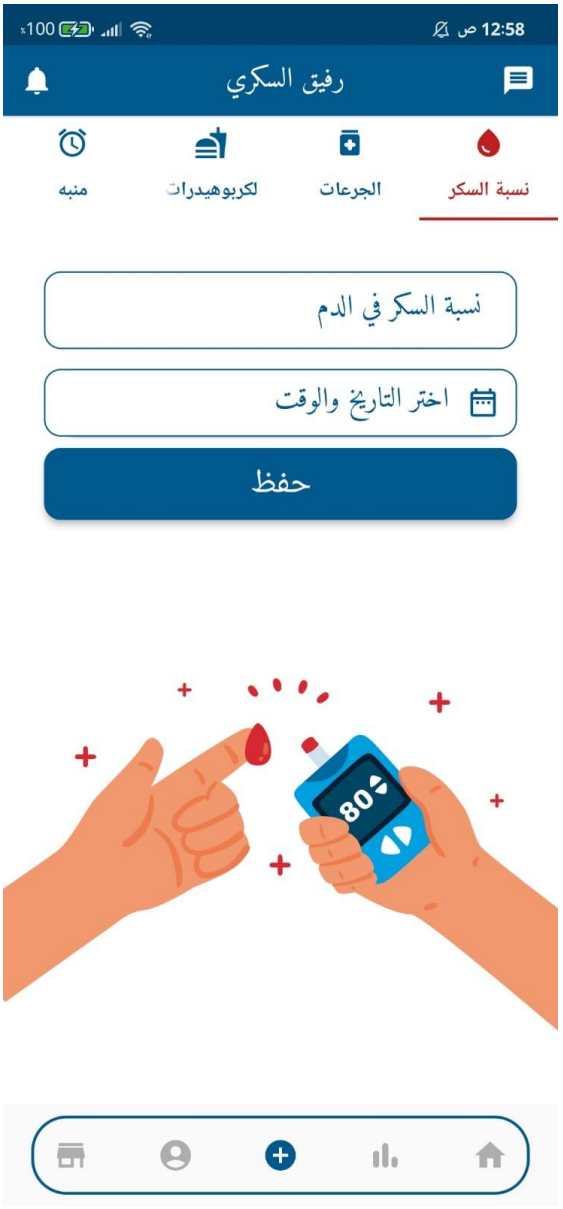


Figure 20: add blood glucose page

This is the blood glucose page, he can add the blood glucose measurements during the day.

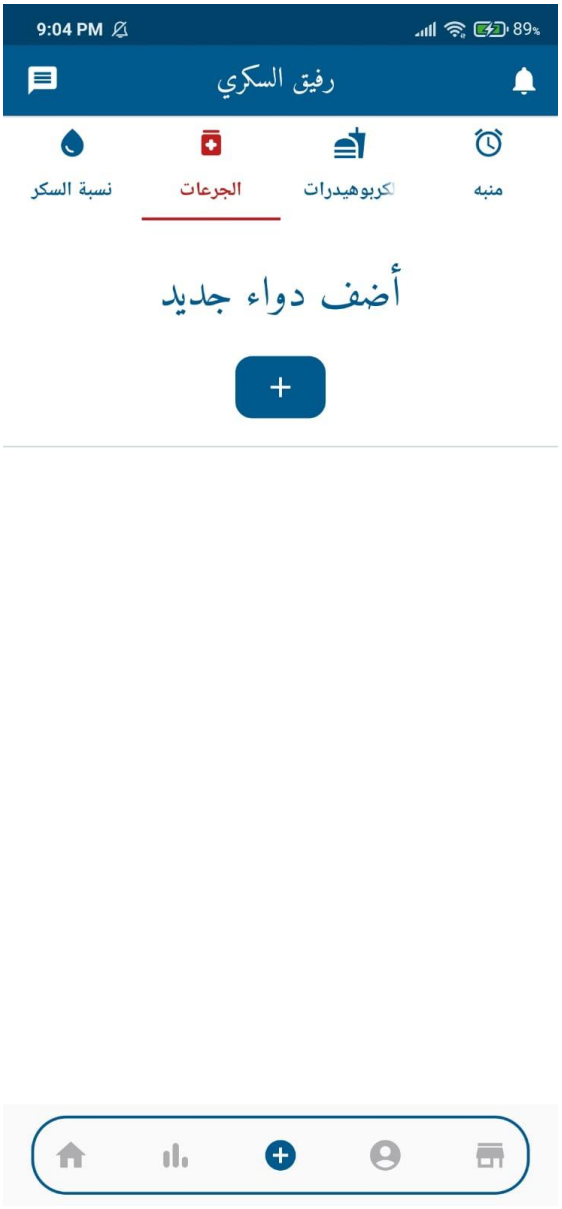


Figure 21: see medicines page

On this page, the patient can see all the medicines he added before, and he can add new ones.

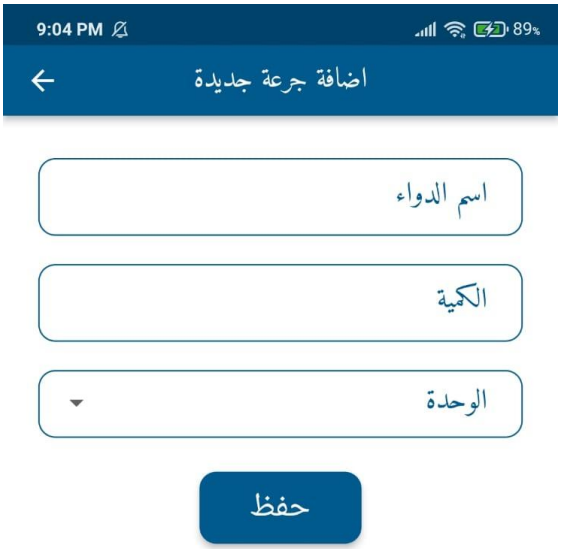
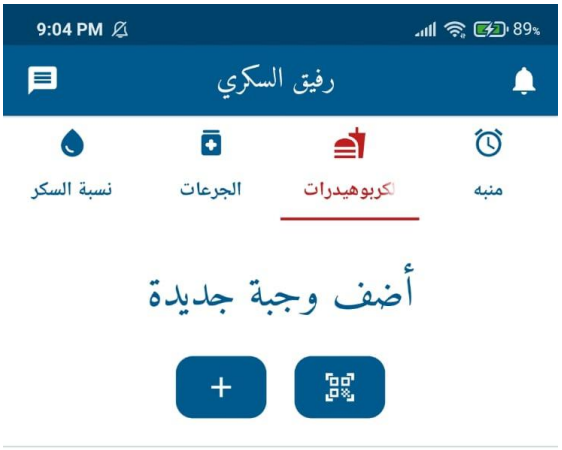


Figure 22: add new medicine

On this page, he can add a new medicine.



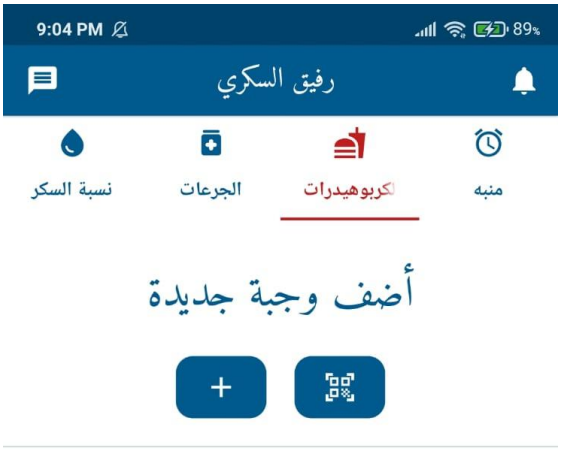


Figure 23: carbs page

On this page, the patient can see all the food he ate, and he can add new ones and see the carbs in the food.

Figure 24: carbs page 2

On this page, he can add new carbs.

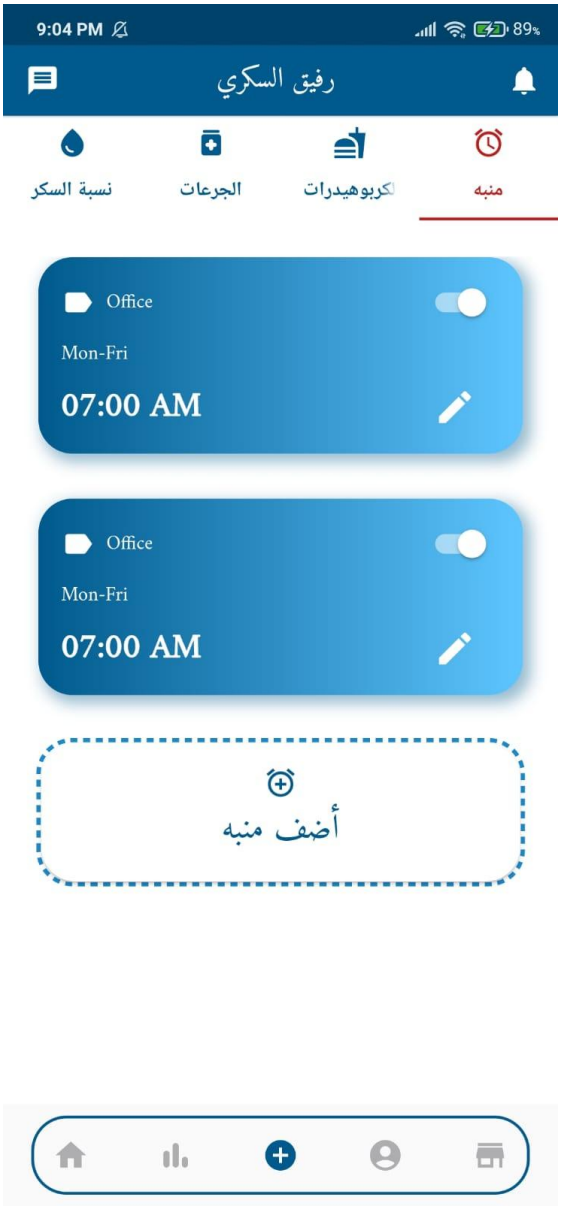


Figure 25: alarm page

On this page, the patient can see all the alarms he added before, and he can add a new alarm and edit it.

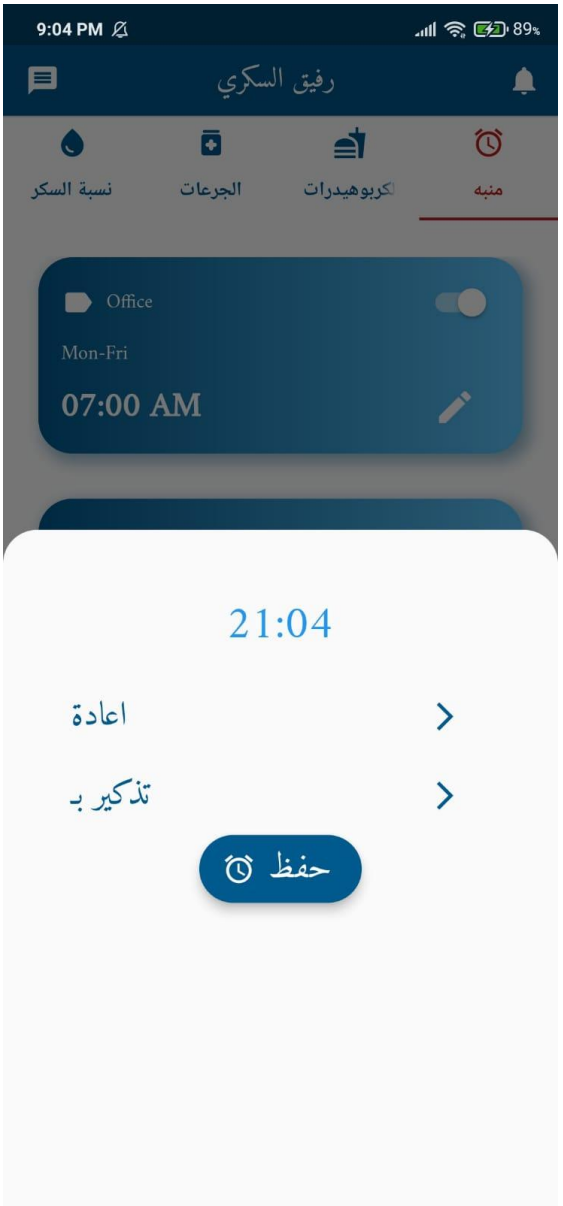


Figure 26: add new alarm

The patient can add a new alarm and edit it.

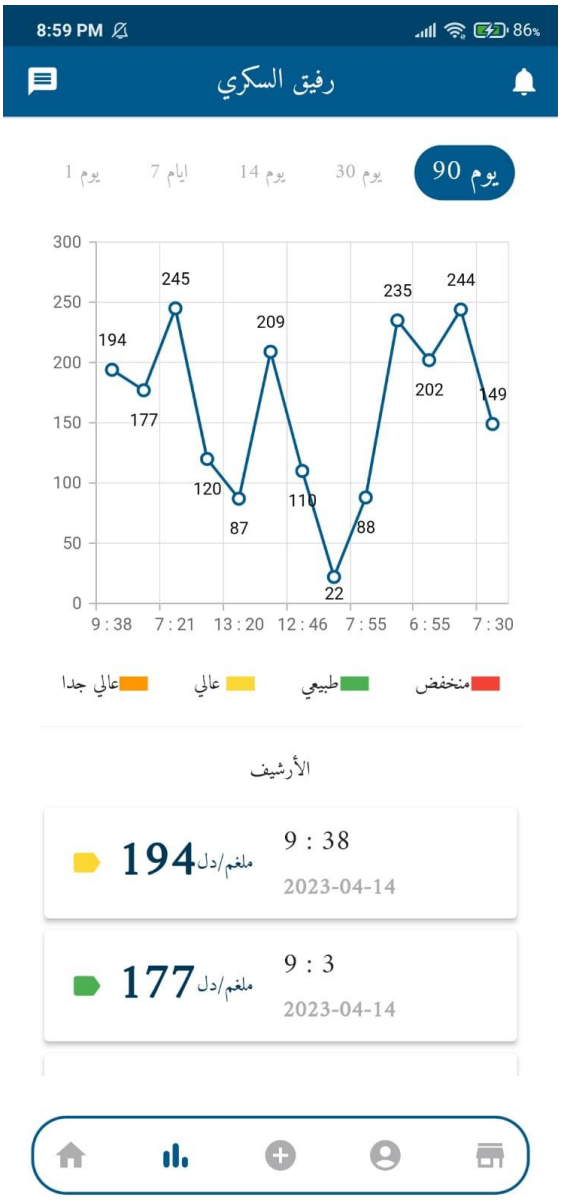


Figure 27: report page

On this page, the patient can see all the doses that he has taken before, for a day, 7 days, 14 days, 30 days, and for 90 days.

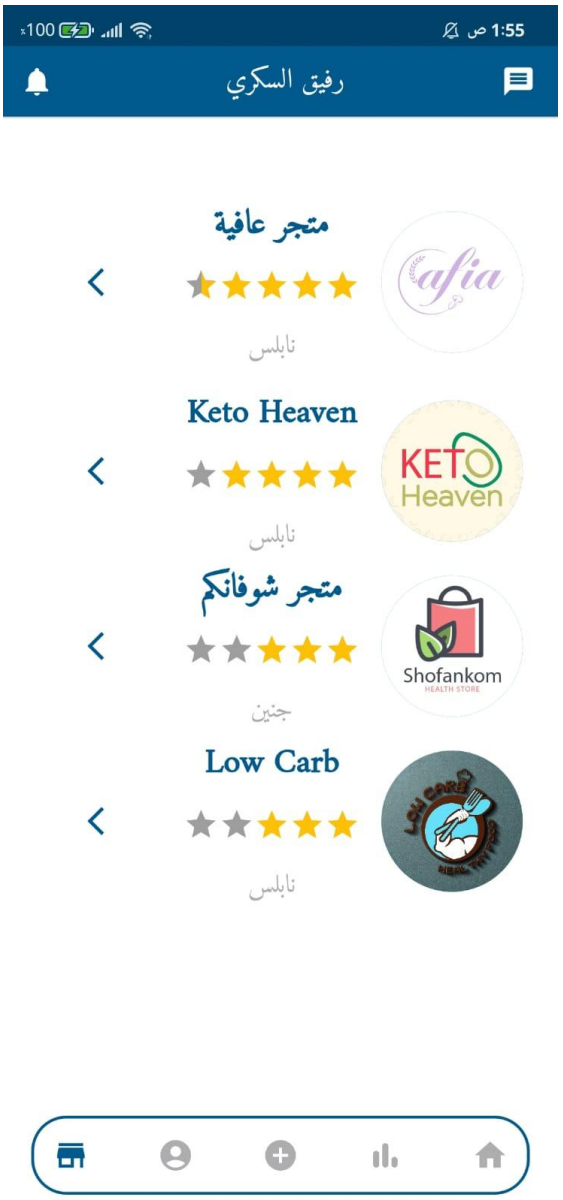


Figure 28: stores page

The patient can see the healthy stores in his country

Figure 29: store page

On this page, the patient can see all the products in any store.

Figure 30: products page

On this page, the patient can see all the products in any store.

Doctor pages:

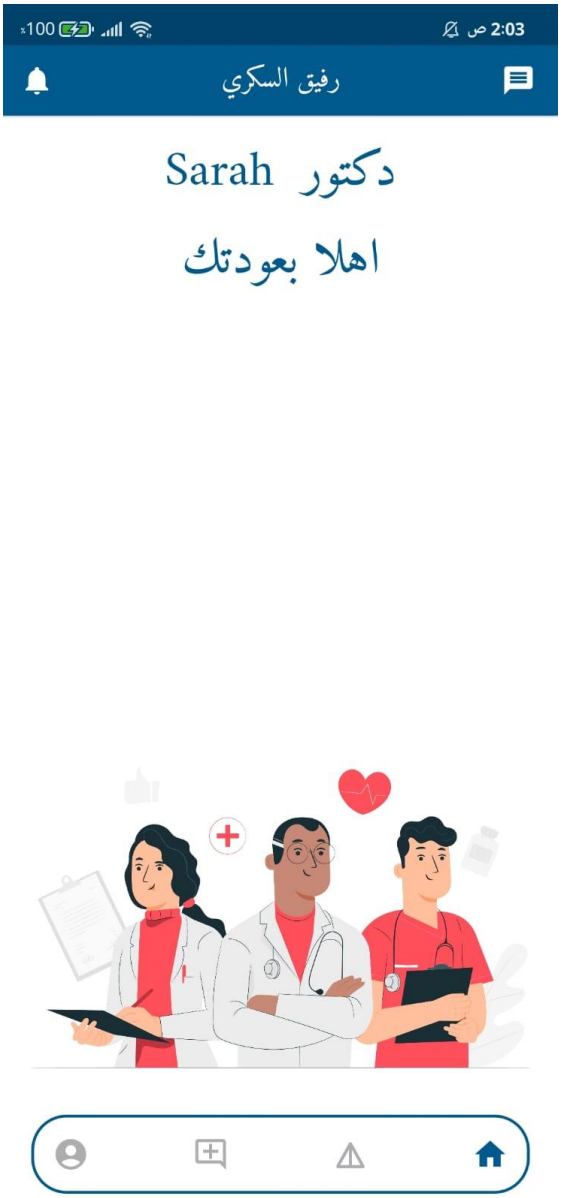


Figure 31: doctor's home page

This is the homepage of the doctor.

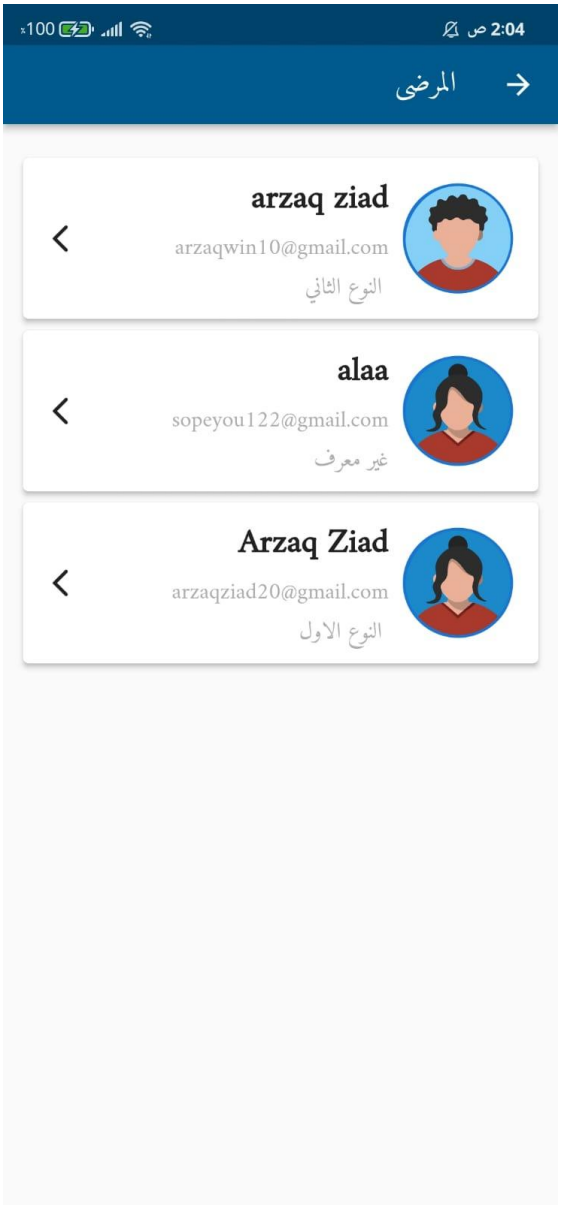


Figure 32: patients page

This page is the chat page, he can chat with many patients as in the image.

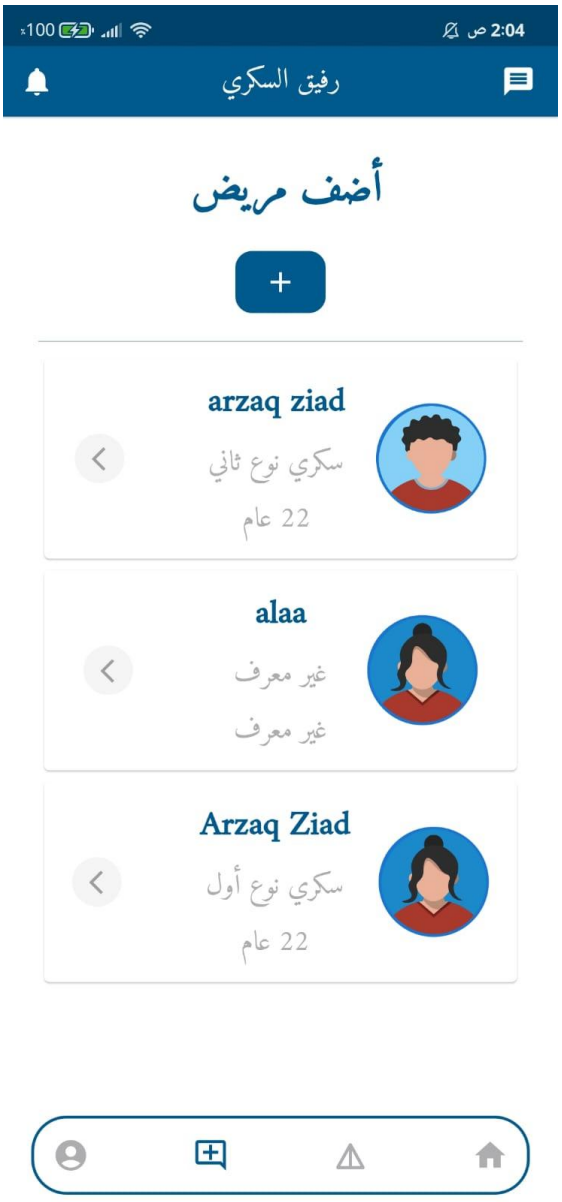


Figure 33: add patient page

On this page, the doctor can see all his patients, and he can add new ones.

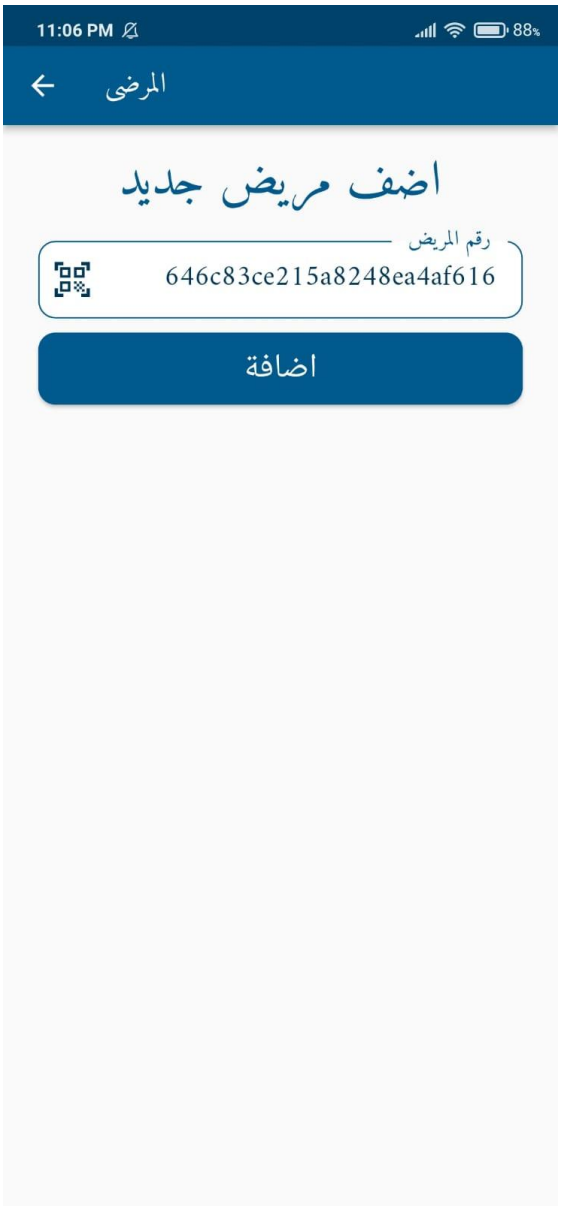


Figure 34: add patient page QRcode

On this page, the doctor can add new patients either through his number or through his QR code.

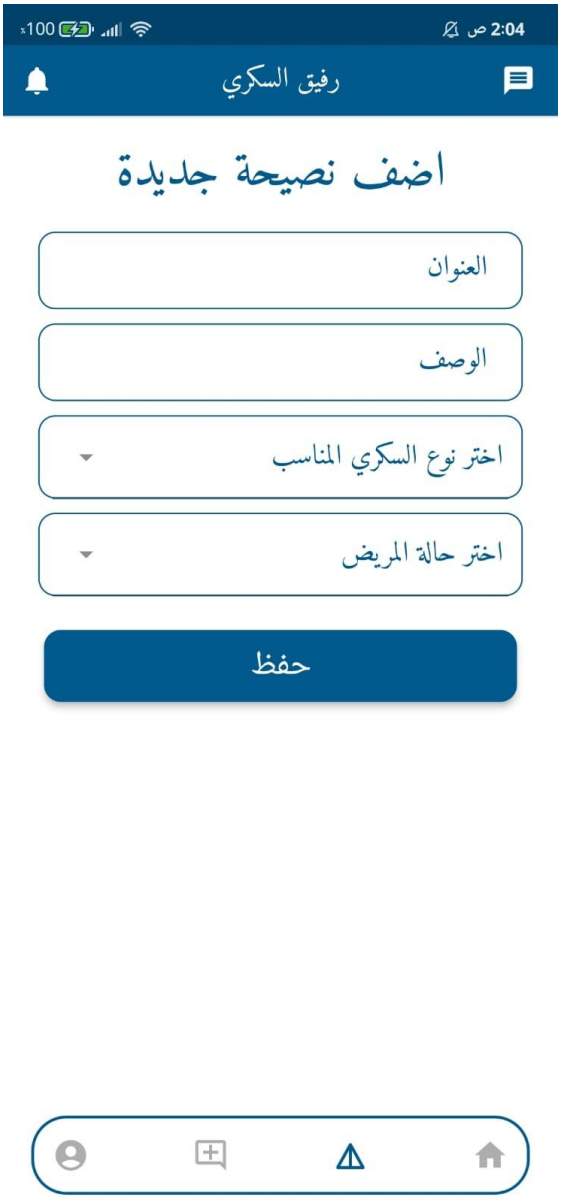


Figure 35: add advice page

On this page, the doctor can add new advice to all his patients.

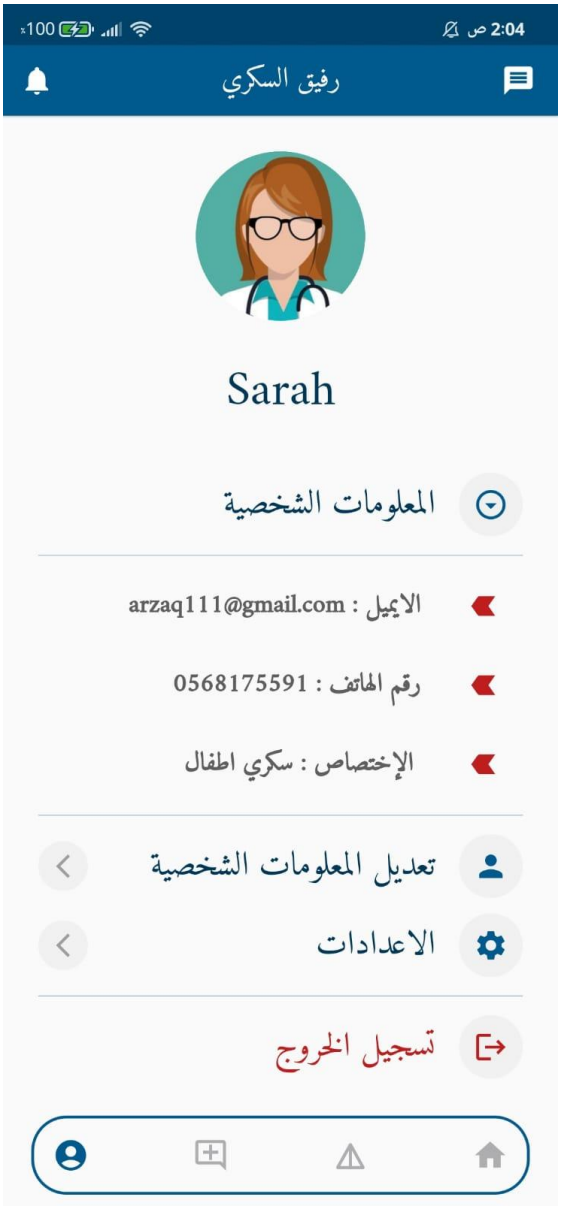


Figure 36: doctor's personal page

On this page, the doctor can see his basic information.

Figure 37: edit doctor's personal information

On this page, the doctor can edit his personal information and reset his password.

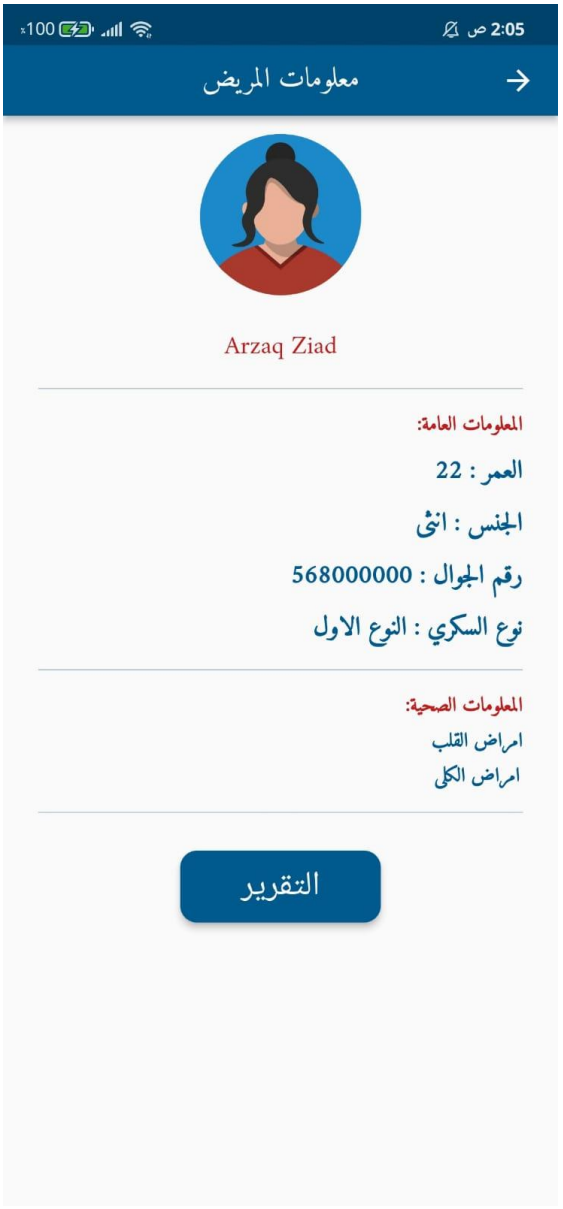


Figure 38: patient's info

On this page, the doctor can see the basic information about every patient, and his report.

Web pages:

The web pages are the same as the application pages. Here are some examples:

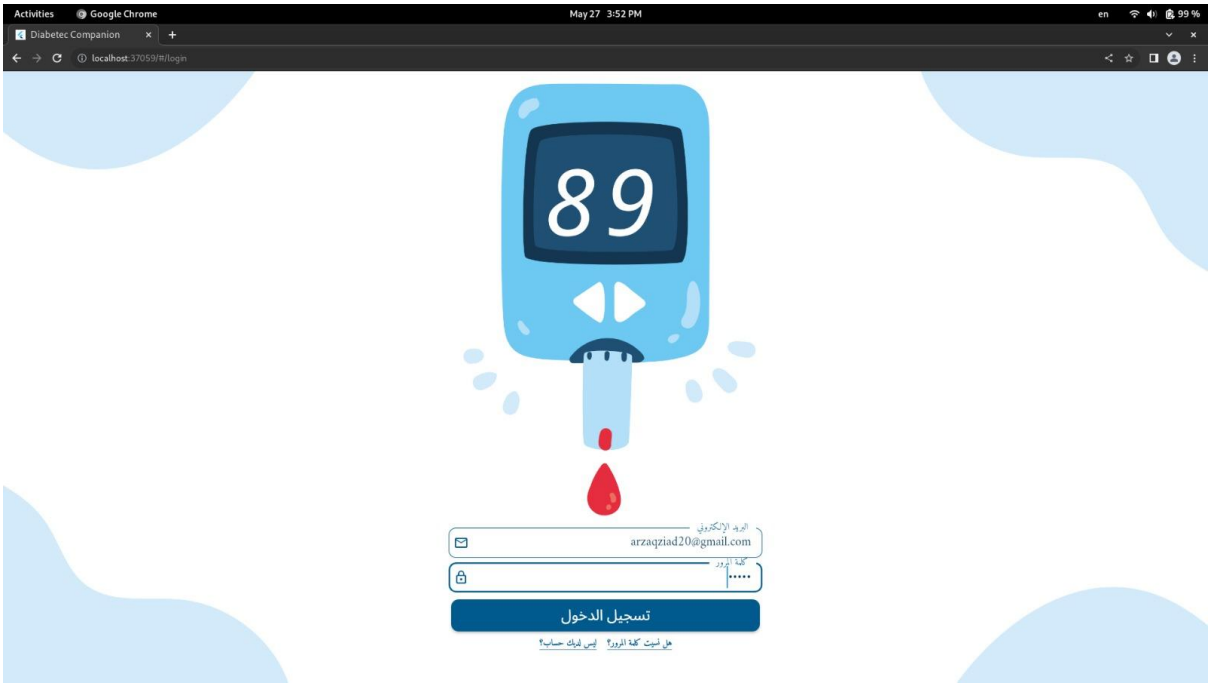


Figure 39: web (login) page

Here is the login page on the web.

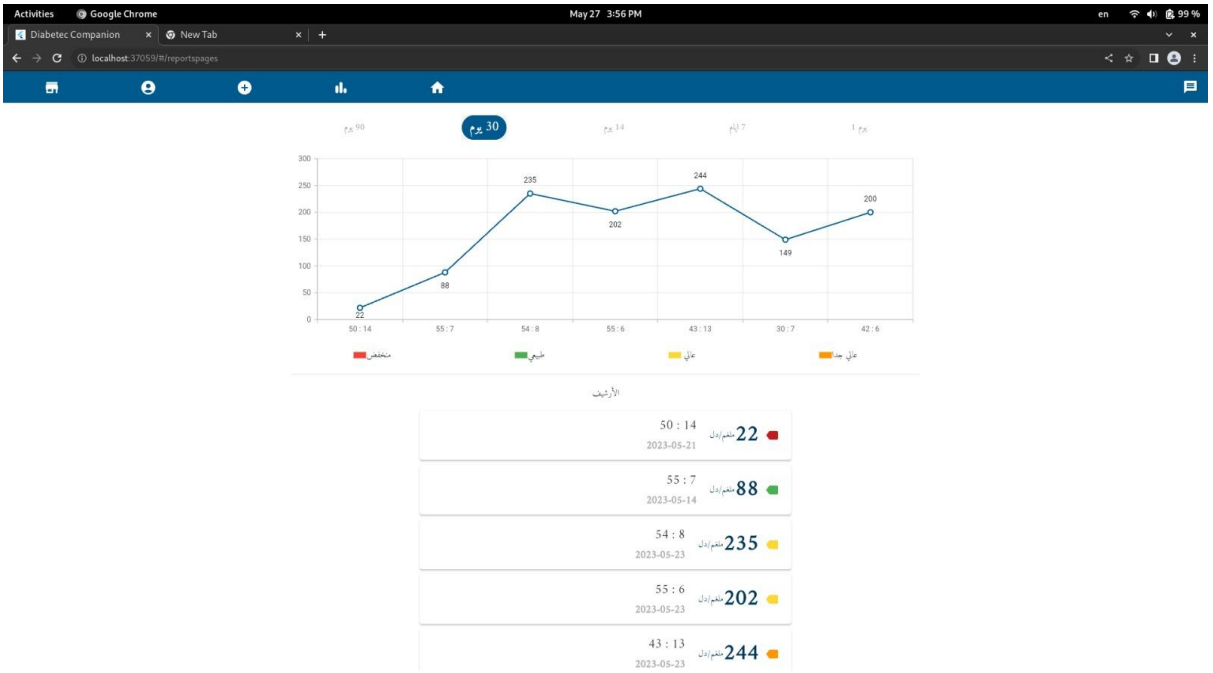


Figure 40: web (report) page

Here is the report page on the web.

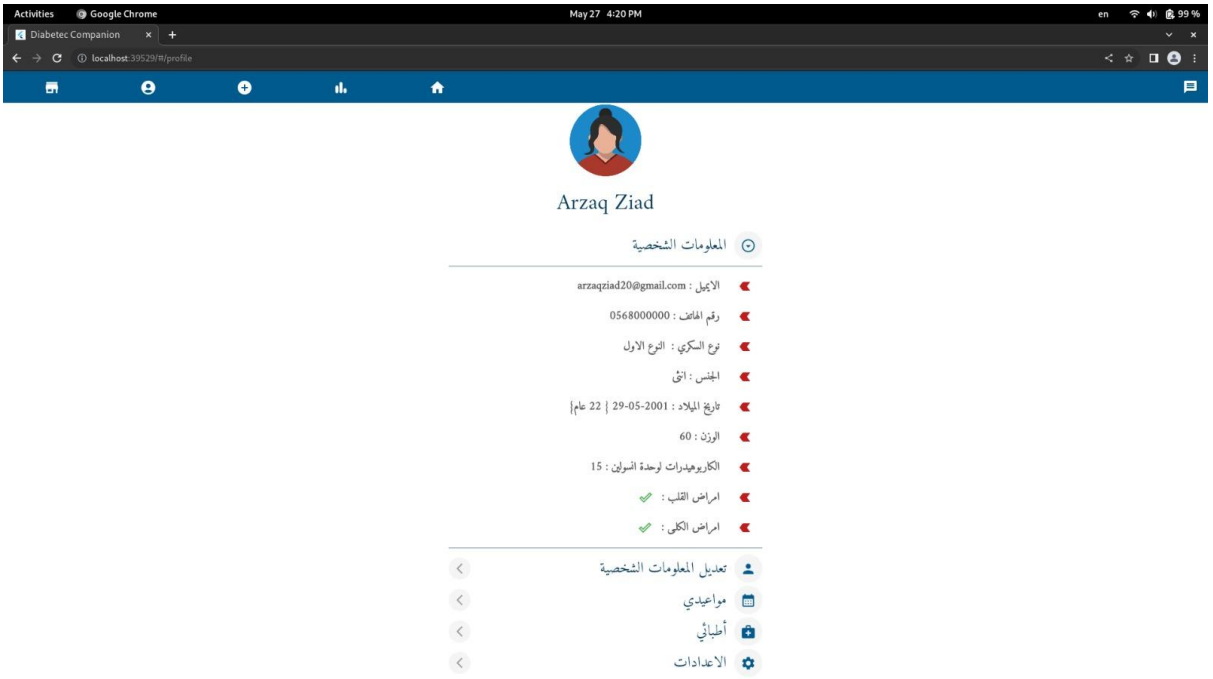


Figure 41: web (patient page)

Here is the personal page for the patient on the web.

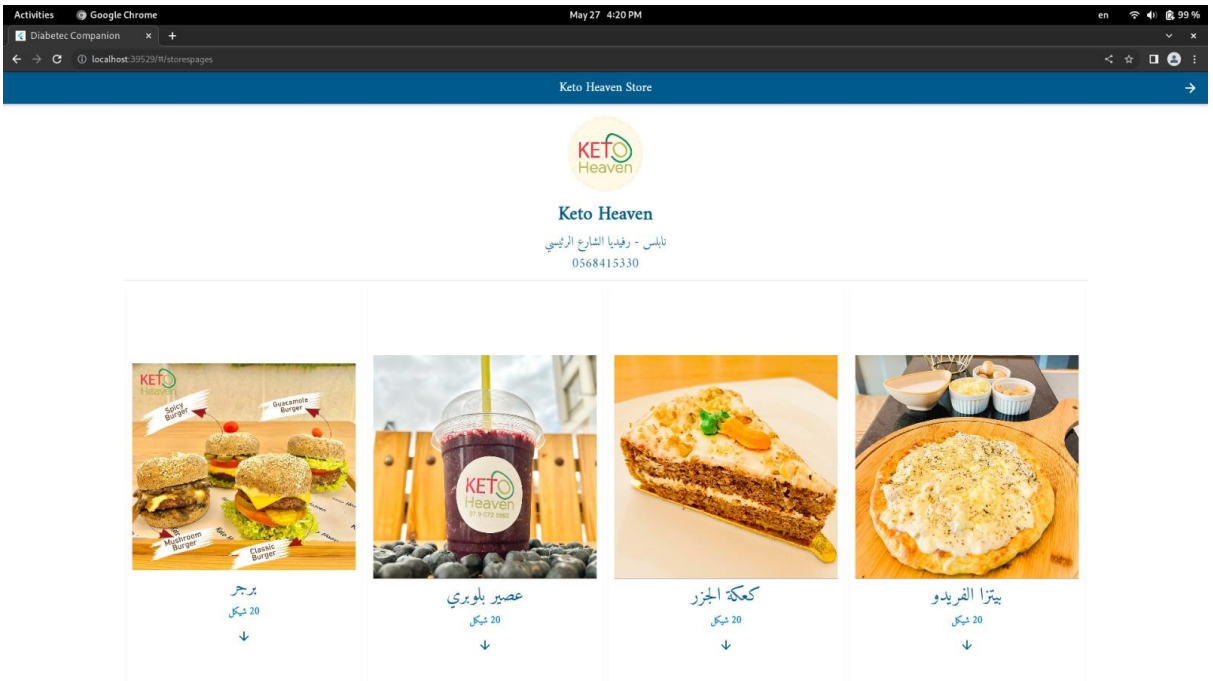


Figure 42: web (store page)

Here is the store page on the web.

Admin pages:

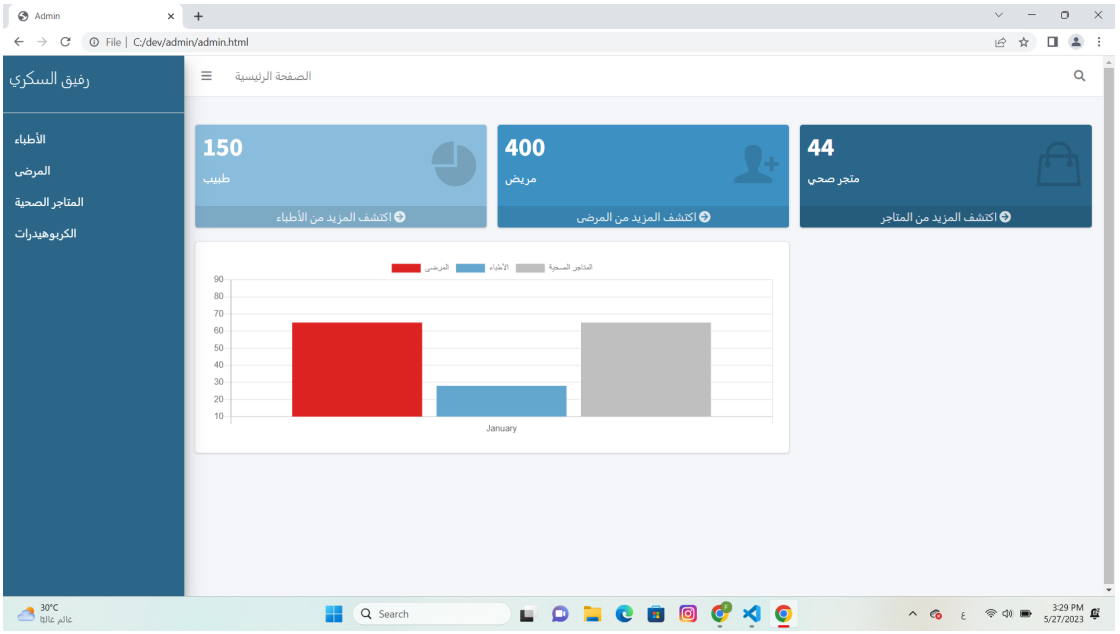


Figure 43: admin (home) page

The admin here can see the number of doctors, patients, and stores.

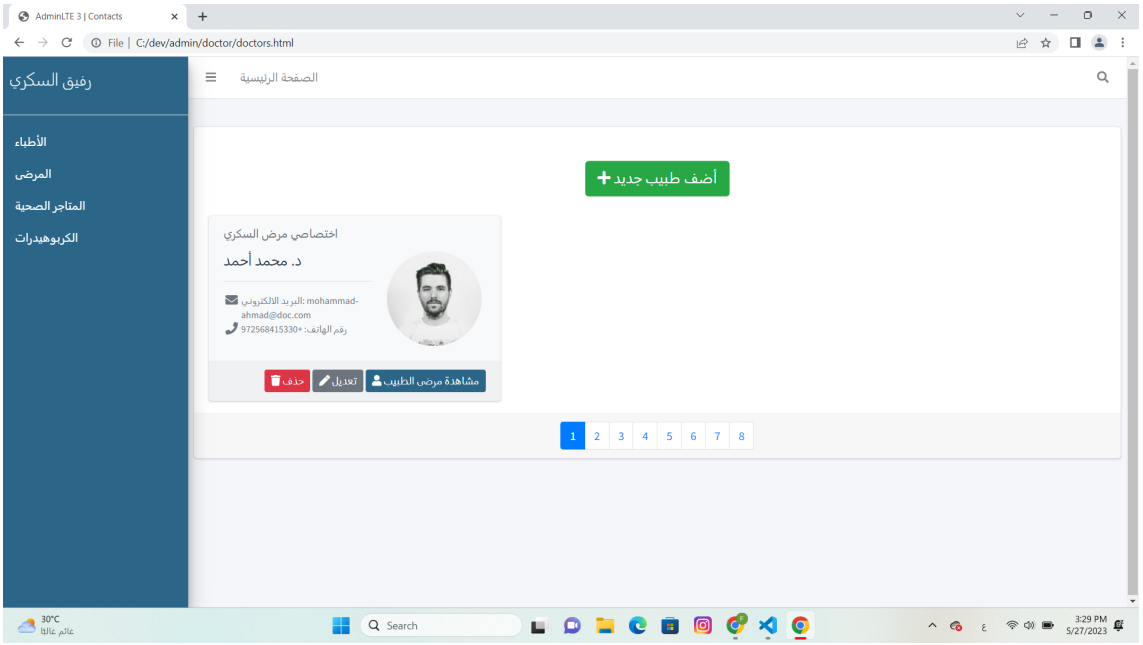


Figure 44: admin (all doctors) page

The admin here can see all the doctors in the application.

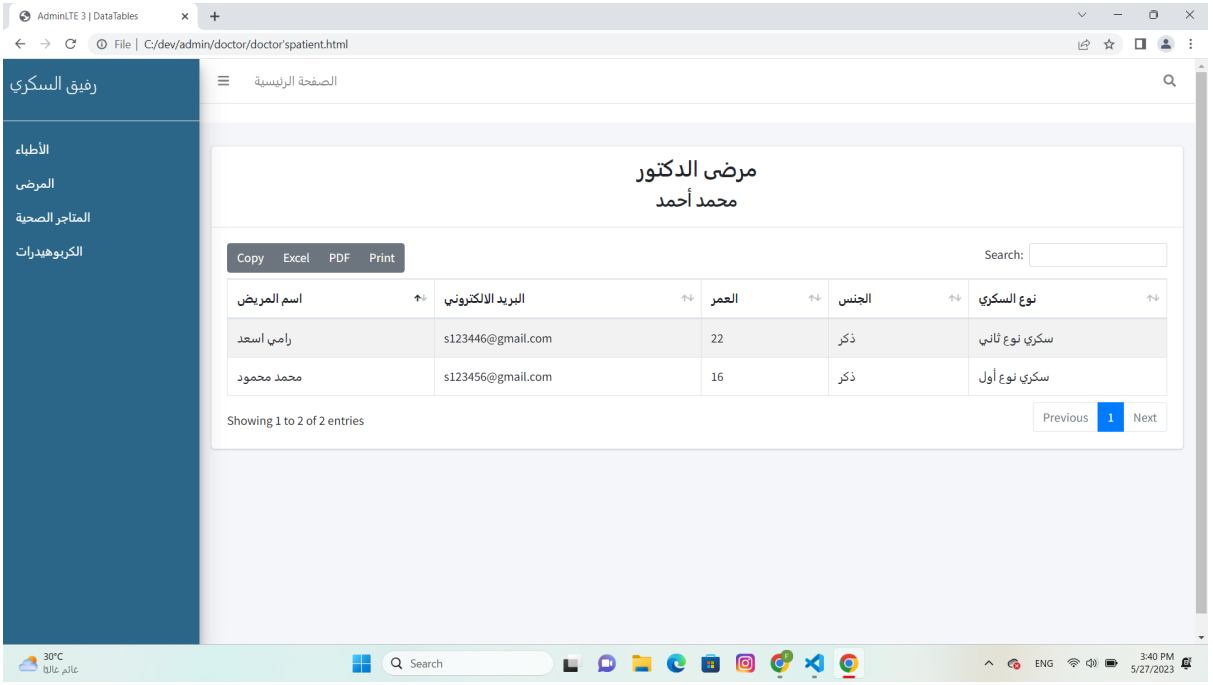


Figure 45: admin (patients for the doctor) page

The admin here can see the patients for a particular doctor.

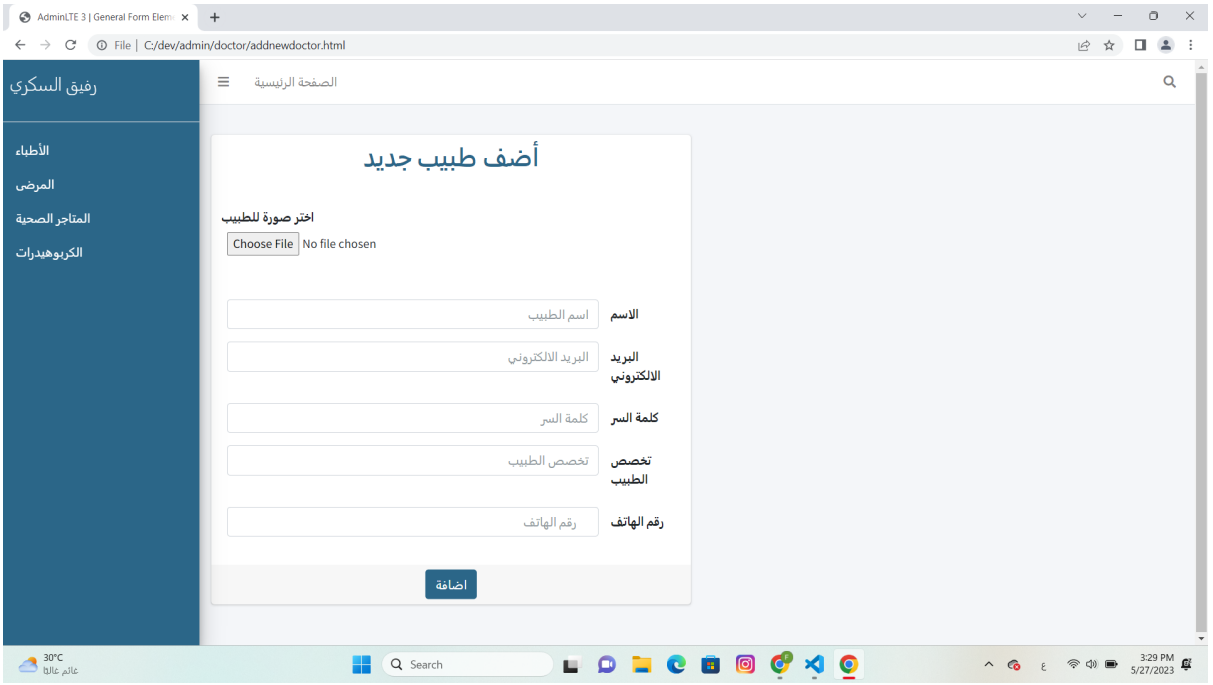


Figure 46: admin (add a new doctor) page

The admin here can add a new doctor.

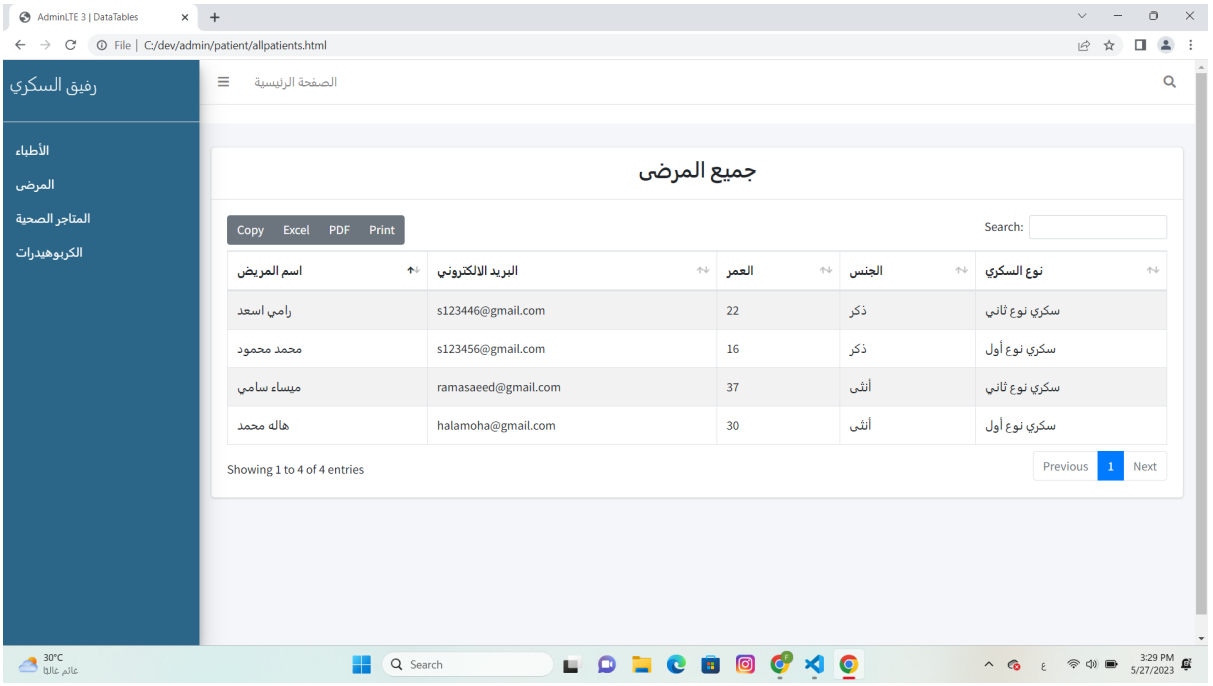


Figure 47: admin (all patients) page

The admin here can see all the patients.

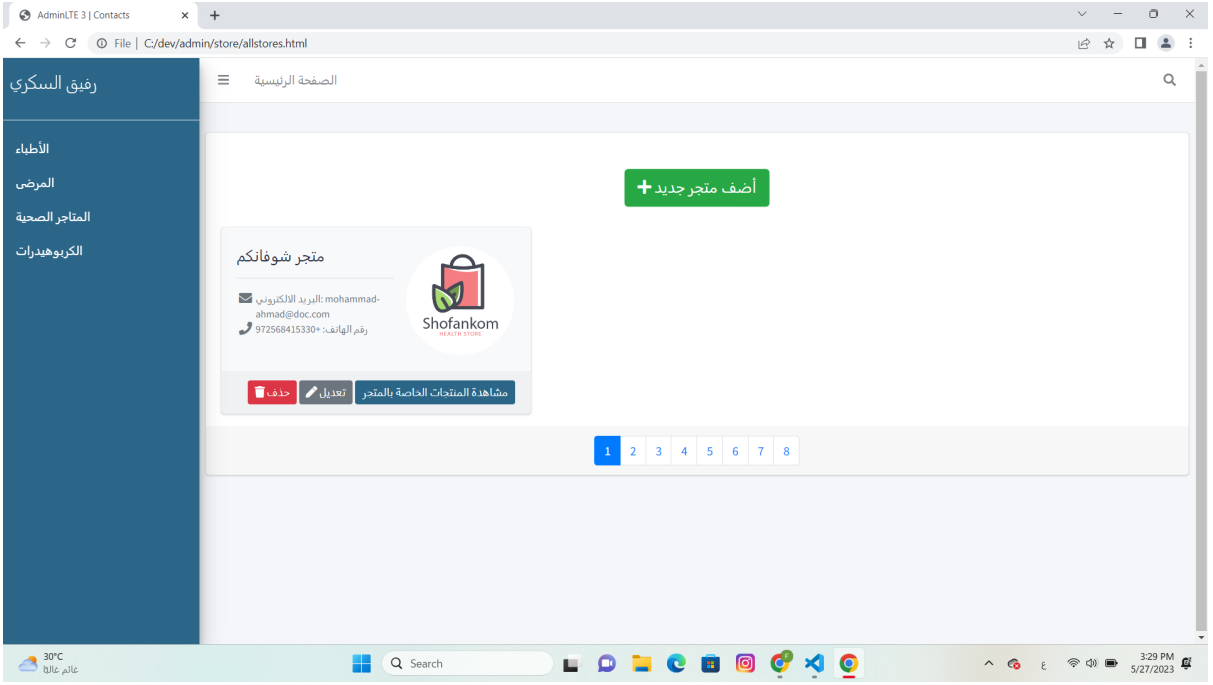


Figure 48: admin (all stores) page

The admin here can see all the stores.

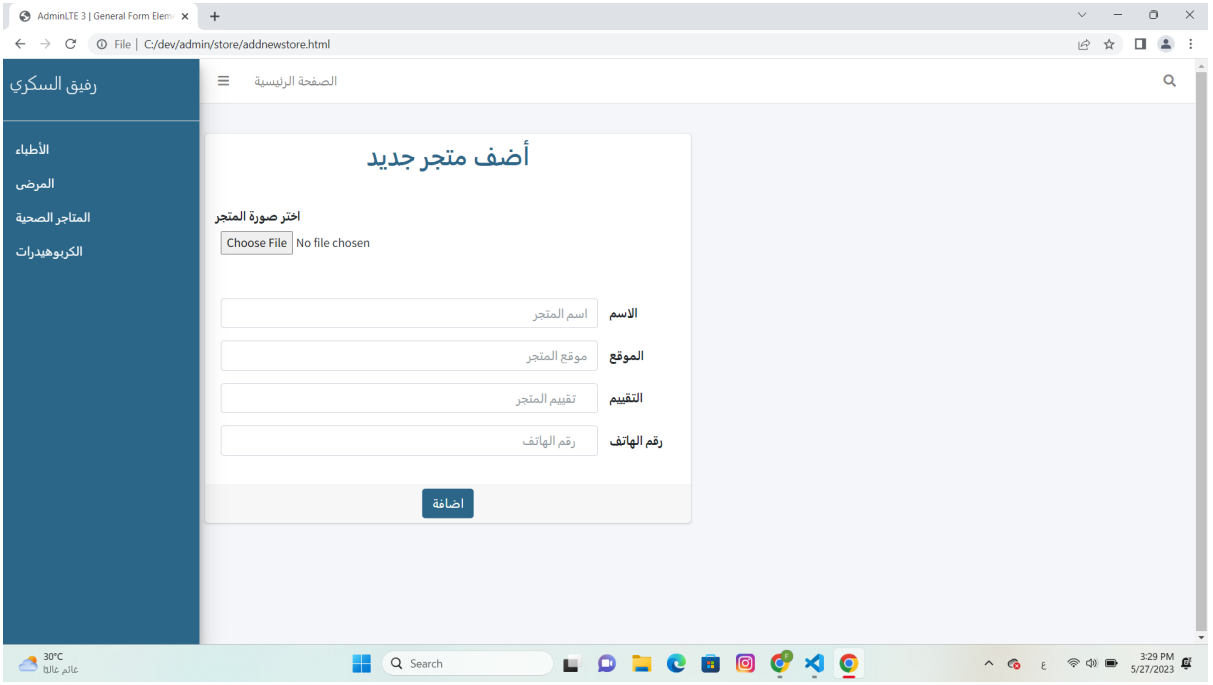


Figure 49: admin (add new store) page

The admin here can add a new store.

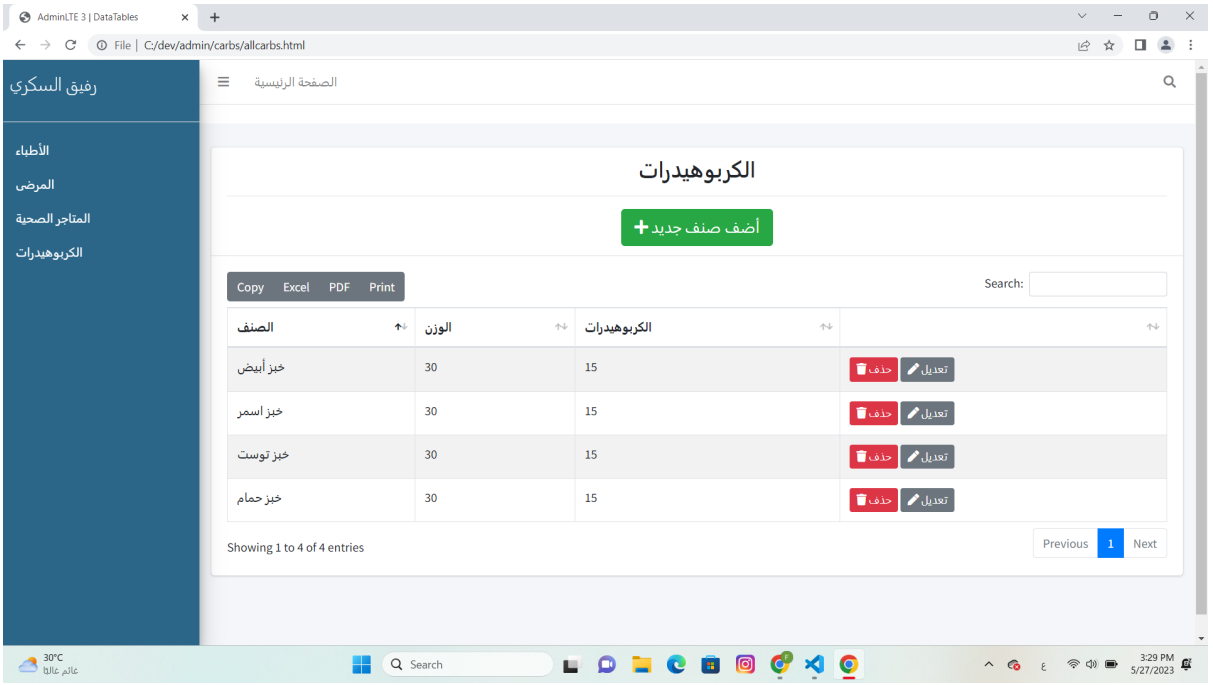


Figure 50: admin (all carbohydrates) page

The admin here can see all the carbs.

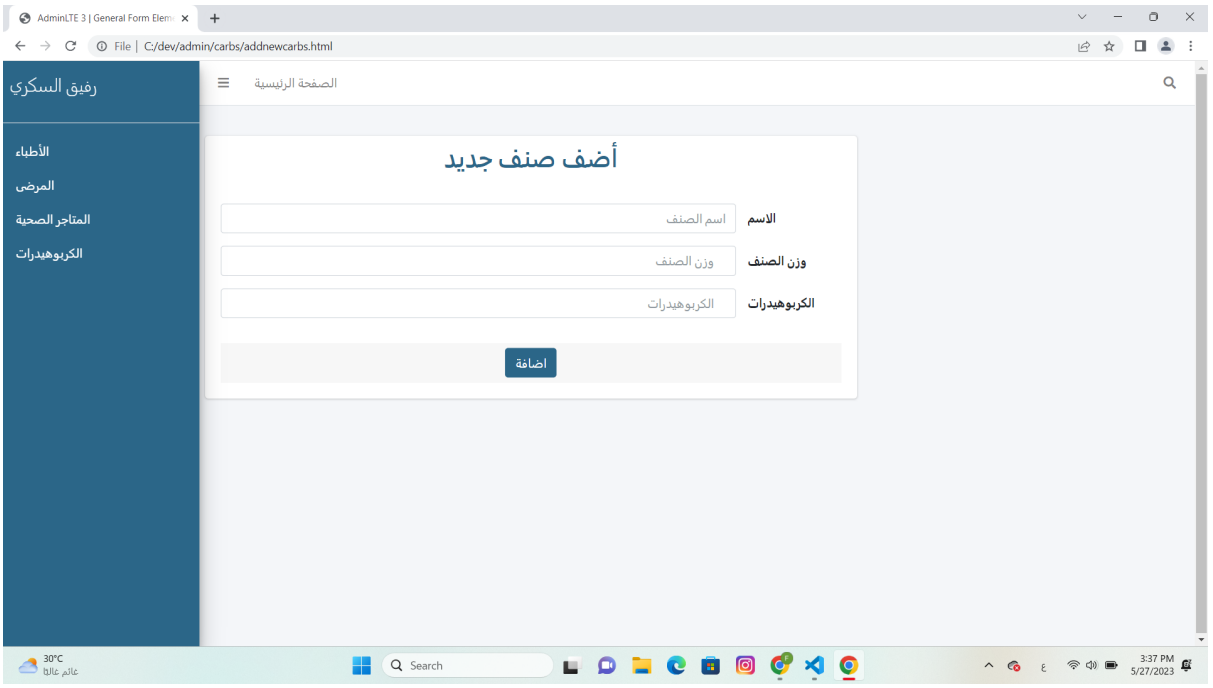


Figure 51: admin (add carbohydrates) page

The admin here can add new carbs.

Fifth chapter

5. Conclusion and Discussion

The findings of this project provide important insights into the development of a mobile app for managing diabetes. The app was designed to help people with diabetes track their blood sugar levels, take medications, and communicate with their doctors and others.

The implications of this project are significant for diabetes management and the use of mobile apps in healthcare. The app has the potential to improve self-management and outcomes for people with diabetes. It can help them adhere to medication and dietary guidelines, leading to better blood sugar control and overall well-being. The app's features for connecting with healthcare providers are also valuable, as they allow users to seek remote guidance and support.

In conclusion, this project has successfully developed a mobile app for managing diabetes. The app has the potential to make a positive impact on the lives of people with diabetes and contribute to the field of digital health technology.

Recommendations

6. Recommendations

To enhance the diabetes project, here are simplified recommendations and future work examples. Firstly, utilize advanced technology like machine learning to offer personalized advice and predictions based on user data. And partner with nutrition experts to offer personalized meal plans and access to diabetes-friendly foods.

Resources

7. Resources

One of the most resources that we benefited from during this project is Dr. Jenan Al-Sha'er. She gave us this website https://diabetes.org/
and these are articles from this website.

Top 10 Things to Know about Insulin for Type 2 Diabetes

Types of Insulin for People with Diabetes