

# Design of a Medical Guide and Healthy Lifestyle Application for Pregnant Women Based on Flutter Web Mobile

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**Abstract** – Pregnancy is a period women that requires careful health monitoring and access to accurate medical information, yet pregnant women still face limitations in accessing digital platforms that provide structured health guidance. This study focuses on developing a web-mobile application using the Flutter framework to deliver medical guidelines and healthy lifestyle recommendations for pregnant women at Puskesmas Mlati 1 Yogyakarta. The development process applies the Waterfall model, which includes requirement analysis, system design, implementation, testing, and maintenance. The main features of the application include medical guidelines, a medical terminology dictionary, healthy food recommendations, examination schedule checking, and daily healthy lifestyle tips. The user interface is designed to be responsive and easy to use, enabling users to access the provided information conveniently. The testing results show that the application runs well across various devices and is capable of supplying the information needed by pregnant women throughout their pregnancy. This application is expected to serve as a practical and educational information tool that supports the improvement of maternal health literacy through digital technology.

**Keyword:** *Flutter, Web-Mobile Application, Pregnancy, Medical Guidance, Healthy Lifestyle.*

## I. INTRODUCTION

Pregnant women require easily accessible and accurate information to maintain their own health and the health of the fetus they are carrying, because timely delivery of health information can significantly reduce pregnancy risks, however many mothers still face difficulties in obtaining practical health guidance, particularly regarding checkup schedules, understanding medical terminology, and adopting a healthy lifestyle carrying [1]. Limited access, busy routines, and the lack of interactive educational media make it difficult for pregnant women to consistently maintain a healthy lifestyle, which may lead to delayed checkups, misinterpretation of symptoms, and increased risks of pregnancy complications such as anemia, hypertension, and fetal growth disorders [2].

Traditional media such as books or brochures are often less appealing and do not encourage interaction, resulting in information not being absorbed optimally. This poses a challenge in increasing health awareness among pregnant women and reducing the risk of health problems during pregnancy [3]. Digital technology opens up opportunities to present more practical solutions. A Flutter-based web-mobile application enables the delivery of medical guidance and healthy lifestyle recommendations with an interactive and responsive interface. Integratable features include a medical terminology dictionary, healthy lifestyle tips, healthy food recommendations, and checkup schedule monitoring. With this application, pregnant women can access information whenever needed and manage their health more easily [4].

This research aims to design a Flutter-based web-mobile application that presents a medical guide and healthy lifestyle recommendations for pregnant women. This application is expected to be an effective and practical digital educational medium, while also encouraging pregnant women to adopt a healthy lifestyle routinely and consistently throughout their pregnancy [5]. In addition to the educational aspect, the digital application can also increase the motivation and compliance of pregnant women in following health guidelines. Interactive media is proven to be more effective than passive media because it provides an experience that actively engages the user, making the information provided easier to understand and apply in daily life [6]. The design of this application emphasizes ease of use for pregnant women, including those less familiar with technology, by applying the design stages of the Waterfall model, where requirement analysis guides the structure and interface functions. A simple interface, clear navigation, and intuitive layout are developed during the system design phase to ensure consistent and efficient use, as supported by previous studies efficiently [7].

Data security and privacy are also important factors in the development of health applications. Users' personal information, such as checkup schedules or health records, must be securely stored so that users feel protected and remain confident in using the application [8]. The Waterfall method was selected because it provides a clear and sequential workflow that allows requirements to be defined early. It is more suitable than iterative models like Agile, since health applications require stable information and should not undergo frequent changes.



## II. RESEARCH METHODOLOGY

This research method in this study uses the Waterfall development model as the main approach in the application development process, supported by previous studies showing that Waterfall is effective for software projects that require clearly defined stages, systematic documentation, and early identification of system requirements to minimize errors during implementation [9]. This model was chosen because its sequential and structured nature is more suitable than iterative methodologies such as Agile, particularly for health-related applications that demand stable and consistent requirements, limited scope for frequent specification changes, and a development flow that ensures each phase is fully completed before moving to the next.

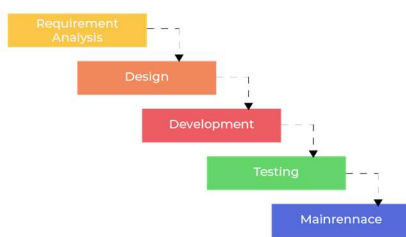


Figure. 1 Model Waterfall

### A. Requirement

The requirements analysis phase in this research includes several activities aimed at understanding user needs and defining the specifications of the system to be built. These activities consist of:

#### 1. System Requirements Analysis

The activities in this stage begin with the process of gathering information regarding the needs and challenges faced by the target users, namely pregnant women and medical personnel. Data collection was carried out through interviews and direct observation at Puskesmas Mlati 1 Yogyakarta. Through this process, information was obtained regarding the obstacles faced in acquiring medical information and healthy lifestyle guidance during pregnancy. In addition, a literature study was conducted on various scientific sources such as journals, articles, and relevant books to strengthen the theoretical foundation of digital-based health applications. The collected data was then analyzed to determine the main requirements that the system must fulfill, including the provision of easily accessible information, interactive features, and a simple and user-friendly interface.

#### 2. System Identification

The Medical Guide and Healthy Lifestyle Application for Pregnant Women is designed to help users easily, quickly, and interactively obtain medical information

and healthy lifestyle guidance. This system consists of three main components: the frontend, backend, and database. The frontend part is developed using Flutter, as this framework supports cross-platform development (web and mobile) with a responsive user interface. The application allows users to access various features, such as a medical terminology dictionary, healthy food recommendations, lifestyle tips, and checkup schedule reminders. Meanwhile, the backend functions to manage data flow, user authentication, and communication between the system and the database. The backend is connected to Firebase as the main database, which can store and display data in real-time with a high level of security.

### B. Design

The system design phase aims to model the design of the Medical Guide and Healthy Lifestyle Application for Pregnant Women that will be implemented. Two main activities are carried out in this phase: system model design using diagrams and database design as the information storage medium. First, a general system design is created using UML (Unified Modelling Language) diagrams to illustrate the interaction between components and the relationships between processes within the system. The diagrams used include the Use Case Diagram and Flowchart. These diagrams serve to explain how users (pregnant women) interact with the system, the application process flow from the main page to features such as healthy food recommendations, healthy lifestyle tips, and a medical terminology dictionary. Subsequently, database design is conducted to define the data structure and relationships between the entities used in the application. The final result of this stage is a system design ready to be used as the basis for the implementation of the Flutter-based application integrated with Firebase as the main data storage.

### C. Development

The development phase is the process of implementing the design results into a functional application. This activity is carried out in stages so that every system component can be built and tested properly. The stages in the development process include:

#### 1. Application Interface Development

This stage focuses on creating the application's appearance using Flutter, which enables cross-platform development (web and mobile). The interface design is tailored to the characteristics of the primary user, namely pregnant women, by emphasizing simplicity, comfort, and soft colours. The interface includes the homepage, healthy food recommendation feature, lifestyle tips, medical terminology dictionary, and checkup schedule reminders. Every UI element is made interactive and

responsive to ensure a good user experience across various screen sizes.

## 2. Backend and Database Development

This stage serves to implement the application logic and data management. The backend uses Firebase as the main service, covering user authentication, real-time data storage, and the sending of reminder notifications. The integration between the frontend and backend is done via API (Application Programming Interface) so that data can be sent and received synchronously between the user and the server [10].

## D. Testing

The testing phase is conducted to ensure that all functions in the Medical Guide and Healthy Lifestyle Application for Pregnant Women operate in accordance with user needs and the designed specifications. The testing method used is Black Box Testing, which is a software testing technique that focuses on examining the output based on input without knowing the internal structure of the program code [11]. This method was chosen because it can assess the accuracy of functions, input validation, and system reliability from the user's perspective. Every main feature, such as healthy food recommendations, the medical terminology dictionary, checkup schedule reminders, and healthy lifestyle tips, is tested with various input scenarios to ensure that the system provides the expected output.

## E. Maintenance

The maintenance phase is the final step in the system development process, aiming to keep the application's performance optimal after deployment. This phase involves monitoring, fixing, and updating the system based on real-world usage and user feedback [12]. Maintenance includes bug fixes, security enhancements, and updating health content according to the latest medical advancements. Furthermore, performance optimization is carried out to ensure the application continues to run smoothly across various devices and operating system versions. Developers regularly implement feature updates, such as adding healthy food data, new health reminders, and improving the user interface to be more user-friendly.

## III. RESULTS AND DISCUSSION

This section discusses the results of the design and development process for the Medical Guide and Healthy Lifestyle application for Pregnant Women, based on Flutter web mobile. The research findings are presented according to the requirements analysis, system design, testing, and implementation phases that were carried out. Each result obtained is compared with theory and findings from previous research to demonstrate the advantages and contributions generated by this system.

## A. Use Case Diagram

This stage aims to illustrate the interaction between users and the system in the Medical Guide and Healthy Lifestyle Application for Pregnant Women. The Use Case Diagram is used to explain the main functions accessible to users and the relationship between system components in carrying out these processes.

Use The resulting Use Case Diagram depicts two main actors: the user (pregnant woman) and the administrator. Users can perform activities such as viewing health information, accessing the medical terminology dictionary, getting healthy food recommendations, and receiving checkup schedule reminders. Meanwhile, the administrator's role is to manage application data, such as adding or updating health information, the list of healthy foods, and healthy lifestyle tips content [13].

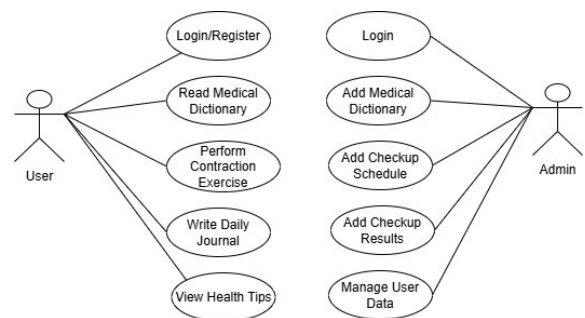


Figure. 2 Use Case Diagram

## B. System Architecture

The system architecture illustrates the relationship between the main components in the application and the flow of data exchange between each part of the system.

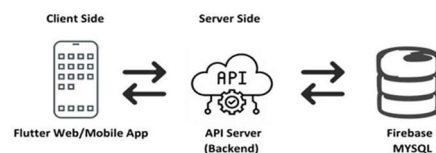


Figure. 3 System Architecture

## C. Flowchart

This stage aims to illustrate the workflow process of the system developed in the Medical Guide and Healthy Lifestyle Application for Pregnant Women. The Flowchart is used to explain the logical sequence and steps taken by the system, starting from the user opening the application until they obtain the necessary information.

The creation of the flowchart is based on the results of the requirements analysis and system design previously conducted. This diagram illustrates the main process flows such as the user logging in, accessing the main page, selecting the desired features (such as healthy food recommendations, medical terminology dictionary,

lifestyle tips, or checkup schedule reminders), until the system displays the results according to the request. Additionally, the flowchart also shows the interaction process between the user and the system regarding data processing and the system's response to user input [14].

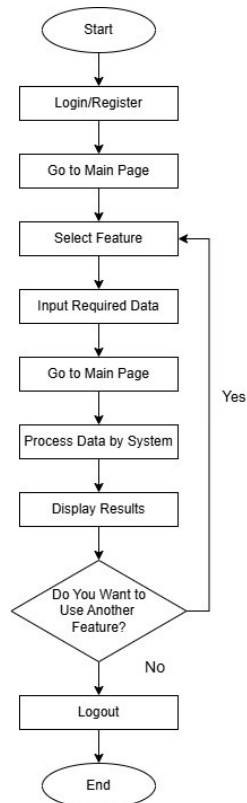


Figure. 4 Flowchart

#### D. Data Dictionary

The Data Dictionary functions to provide a detailed explanation of the data structure used in the Medical Guide and Healthy Lifestyle Application for Pregnant Women. Every entity contained within the database is described through its attributes, data type, and a description of its function within the system.

Table 1. User Base

| Field     | Type    | Description        |
|-----------|---------|--------------------|
| User_id   | int     | Primary Key        |
| User_name | varchar | User Name          |
| Email     | varchar | User Email         |
| Password  | varchar | Encrypted Password |

Table 2. Medical Dictionary Base

| Field         | Type    | Description      |
|---------------|---------|------------------|
| Dictionary_id | int     | Primary Key      |
| Term          | varchar | Medical Term     |
| Definition    | text    | Term Explanation |

Table 3. Health Tips Base

| Field       | Type    | Description                                   |
|-------------|---------|---|
| Tip_id      | int     | Primary Key                                   |
| Tip_title   | varchar | Tip Title                                     |
| Tip_content | text    | Content or Tip Body                           |
| Category    | varchar | Nutrition, sports, mental health, and others. |

Table 4. Contraction Exercise Base

| Field         | Type    | Description                    |
|---------------|---------|--------------------------------|
| Exercise_id   | int     | Primary Key                    |
| Exercise_name | varchar | Name or type of exercise       |
| Description   | text    | Exercise Instruction           |
| Duration      | int     | Exercise duration (in seconds) |

Table 5. Checkup Schedule Base

| Field        | Type    | Description  |
|--------------|---------|--------------|
| Schedule_id  | int     | Primary Key  |
| Checkup_date | date    | Checkup Date |
| Notes        | varchar | Short Note   |

Table 6. Daily Journal Base

| Field           | Type | Description          |
|-----------------|------|----------------------|
| Journal_id      | int  | Primary Key          |
| User_id         | int  | Foreign Key          |
| Journal_date    | date | Recording Date       |
| Journal_content | text | Daily Record Content |

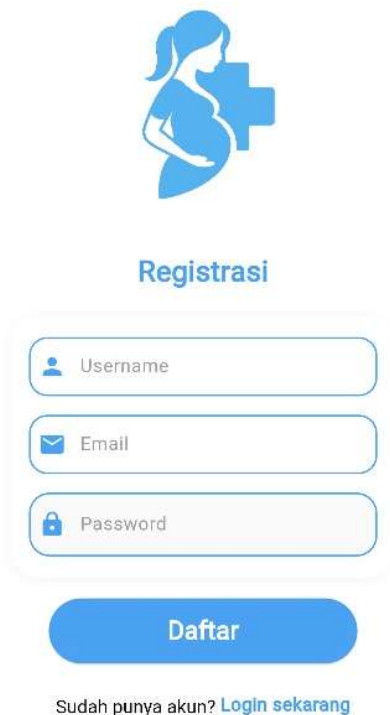
#### E. Application Display

The purpose of this stage is to illustrate the workflow process of the system developed in the Medical Guide and Healthy Lifestyle Application for Pregnant Women. The Flowchart is used to explain the logical sequence and steps taken by the system, from the user opening the application until they obtain the necessary information.

### 1. Registration Page

The registration page is the initial view used by new users to create an account before they can access the main features of the application. On this page, users are asked to enter basic information such as full name, email address, and password.

The design of the registration page is kept simple with a neat layout and soft colours to provide a sense of comfort and avoid confusing the user.



The registration page features a blue silhouette of a pregnant woman with a plus sign. Below it is the title "Registrasi" in blue. The form consists of three input fields: "Username" (with a person icon), "Email" (with an envelope icon), and "Password" (with a lock icon). A blue "Daftar" button is at the bottom. A link "Sudah punya akun? Login sekarang" is positioned below the button.

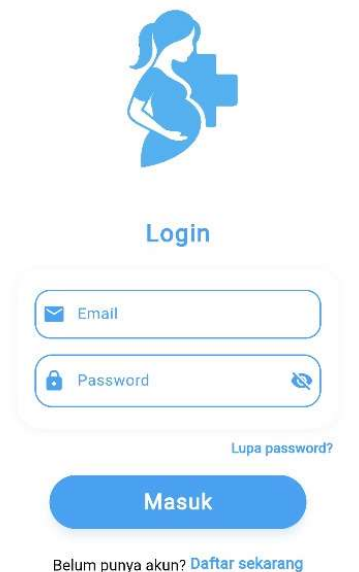
Figure. 5 Registration Page

### 2. Login Page

The login page serves as the main gateway for users to enter the system after registration. Users need to enter their registered email and password to access the features within the application.

Security features such as credential validation and password encryption are implemented to protect user data from unauthorized access. If the entered data is incorrect, the system will display an error message so that the user can correct it.

The login page interface is designed with a clean appearance and clear navigation icons, allowing users to easily log in to the application without experiencing difficulty during the authentication process.

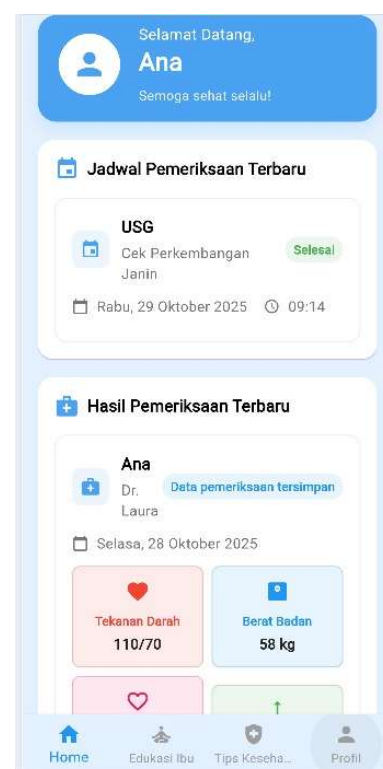


The login page features a blue silhouette of a pregnant woman with a plus sign. Below it is the title "Login" in blue. The form consists of two input fields: "Email" (with an envelope icon) and "Password" (with a lock icon and a toggle for visibility). A blue "Masuk" button is at the bottom. A link "Lupa password?" is positioned above the button. A link "Belum punya akun? Daftar sekarang" is positioned below the button.

Figure. 6 Login Page

### 3. Home Page

The Home Page is the view that appears after the user successfully logs into the application. On this page, users can immediately view important information related to pregnancy health, as well as notifications from the admin regarding their checkup schedule and the results of completed health examinations.



The home page features a blue header with a user profile icon, the name "Ana", and the greeting "Selamat Datang, Ana". Below the header is a section titled "Jadwal Pemeriksaan Terbaru" (Latest Examination Schedule) showing a "USG" checkup scheduled for "Rabu, 29 Oktober 2025" at "09:14". Below this is a section titled "Hasil Pemeriksaan Terbaru" (Latest Examination Results) showing results for "Ana" (Dr. Laura) on "Selasa, 28 Oktober 2025". The results include "Tekanan Darah" (Blood Pressure) of "110/70" and "Berat Badan" (Body Weight) of "58 kg". At the bottom is a navigation bar with icons for "Home", "Edukasi Ibu", "Tips Keseha...", and "Profil".

Figure. 7 Home Page



#### 4. Medical Dictionary Page

The Medical Dictionary Page serves as a source of health terminology information designed to help pregnant women understand various medical terminologies frequently used in checkups or pregnancy consultations. This feature provides concise and easily understandable explanations, so users do not need to feel confused by medical terms that arise during pregnancy.

On this page, users can search for medical terms directly through the search column, and the system will then display a list of relevant terms along with a brief explanation of their meaning and function. Each term is presented in the form of an information card containing the name of the term, a brief definition, and a book icon as a symbol of health education.

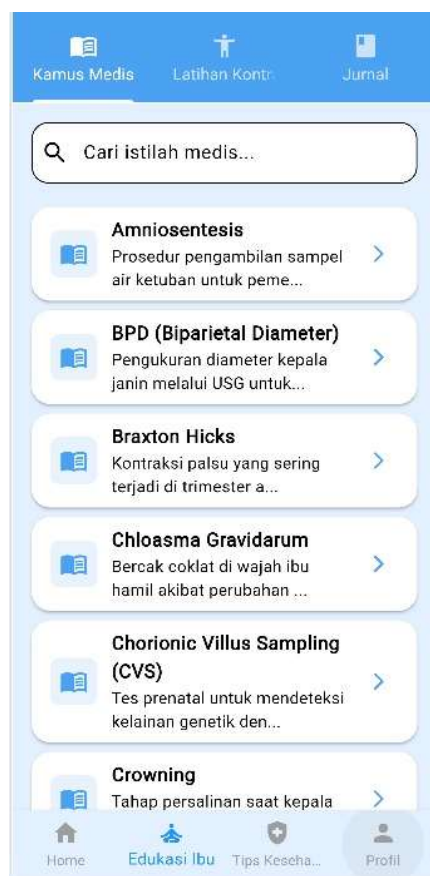


Figure. 8 Medical Dictionary Page

#### 5. Contraction Exercise Page

The Contraction Exercise Page serves as an interactive feature that helps pregnant women prepare for the labor process through breathing exercises and muscle relaxation. This feature is designed so that users can follow a contraction simulation safely and comfortably, training the body to be better prepared for actual contractions.

On this page, users will find guidance on the best practice times, such as in the morning after waking up or in the afternoon when the body is in a relaxed state. There is

also a "Relaxation Tips" button that provides simple advice for maintaining calmness, such as controlling breathing, staying hydrated, and finding a comfortable sitting position during the exercise.

Furthermore, the "Start Simulation" feature allows users to run a contraction exercise that mimics the rhythmic pattern of contractions and breaks during labor. During the simulation, the system provides timed instructions for inhaling, holding, and exhaling with specific intervals. This exercise not only helps physically but also plays a role in reducing anxiety levels leading up to birth.



Figure. 9 Contraction Exercise Page

#### 6. Daily Journal Page

The Daily Journal Page functions as a private recording medium for pregnant women to document their activities, physical condition, and feelings experienced daily throughout the pregnancy. This feature allows users to write journal entries whenever needed and automatically saves them within the system.

On this page, users can add new journal entries by including the date, day, month, and year, so that each record can be neatly organized chronologically. Furthermore, users also have the option to edit or delete previously created notes to ensure that the stored information remains accurate and relevant.



Figure. 10 Daily Journal Page

### 7. Health Tips Page

The Health Tips Page functions as an educational feature that provides various important information regarding self-care and a healthy lifestyle during pregnancy. This feature helps pregnant women gain practical insights into health topics, such as fulfilling nutritional needs, balanced diet, light exercise, and positive habits that support fetal development and maternal health.

On this page, the system displays a concise list containing the title and content snippet of each health tip. Each entry is accompanied by a “Read More” button that can be clicked to open a detailed view containing the complete explanation. In this way, users can read the topics most relevant to their needs without having to open the entire list at once, making the reading experience more efficient and focused.

In addition to presenting educational content, this feature is also designed to encourage the awareness and consistency of pregnant women in adopting a healthy lifestyle. Every article is composed in easily understandable language and contains practical advice that can be directly applied in daily life.



Figure. 11 Health Tips Page

### 8. Profile Page

The Profile Page serves as the central hub for managing personal data and user preferences within the Medical Guide and Healthy Lifestyle Application for Pregnant Women. On this page, users can manage their personal information, access help, adjust the display language, and securely log out of their account with ease.

The edit profile feature allows users to update data such as their name, change their profile picture, or other information relevant to the application's use. This facility helps ensure that every user has accurate data according to their latest condition. Additionally, a help menu is available, which contains a guide and brief explanations on how to use the main features, allowing new users to adapt quickly without confusion.

A language menu is provided to adjust the application's display according to user needs, making the usage experience more comfortable and inclusive. Meanwhile, the logout button functions as a security measure for users to securely exit their account after using the application, in order to protect their privacy and personal data.

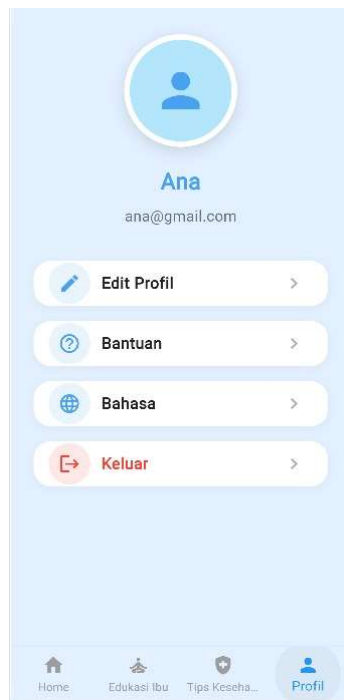


Figure. 12 Profile Page

#### 9. Admin Main Page

The Admin Main Page functions as the application control center, where the admin can manage various aspects related to users and application content. This page includes menus such as Dashboard, Manage Users, Medical Dictionary, Checkup Schedule, and Checkup Results. On the Dashboard, the admin can view a summary of important information, such as the number of registered users, daily journals, and the latest health tips. The Manage Users menu allows the admin to add, edit, or delete user accounts as needed. The Medical Dictionary serves to add new medical terms so that the information available to users is always complete and accurate. Checkup Schedule is used to add and organize checkup schedules for pregnant women, allowing the admin to ensure every examination is neatly recorded. Meanwhile, Checkup Results enables the admin to add notes on the examination results completed by users, making health data recorded and easily monitored. All these pages are designed to be easily accessible, interactive, and to facilitate the admin in performing efficient application management through a neat and structured display.

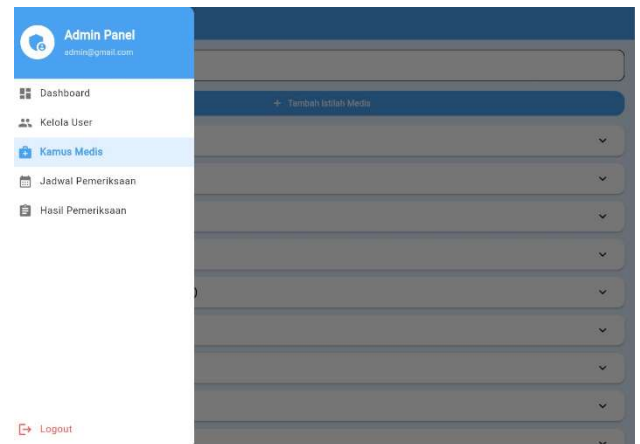


Figure. 13 Admin Main Page

#### 10. Admin Medical Dictionary Page

The Medical Dictionary Page for the admin functions as the place to manage the medical terms available in the application. On this page, the admin can add new medical terms along with their complete definitions or explanations so that users can better understand the health information. Besides adding new terms, the admin also has the capability to edit existing terms if there are corrections or updates.

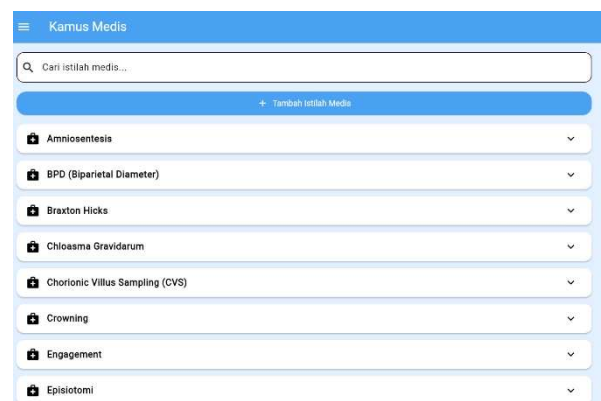


Figure. 14 Admin Medical Dictionary Page

#### 11. Admin Examination Schedule Page

The Examination Schedule Page for the admin functions as the place to add and manage checkup schedules for pregnant women. On this page, the admin can create new schedules by adding the date, time, type of examination, and other important notes. Besides adding new schedules, the admin also has the ability to edit existing schedules if there are changes, and delete schedules that are no longer relevant.



Figure. 15 Admin Examination Schedule Page

## 12. Admin Examination Results Page

The Admin Examination Results Page functions as the hub for managing and recording the health examination results of pregnant women. On this page, the admin can add new examination results, including important data such as blood pressure, body weight, fetal heart rate, and other relevant health information. Besides adding new results, the admin can also edit previously recorded examination results to update or correct data, and delete results that are no longer necessary.

Figure. 16 Admin Examination Results Page

## F. Black Box Testing

Black Box Testing is conducted to ensure that all features in the Medical Guide and Healthy Lifestyle application function according to specifications without reviewing the internal code [15]. This method focuses on testing the system's functionality, where every input is tested to ensure the application's response is as expected. This testing aims to evaluate whether the main features, both for users (pregnant women) and administrators, are working properly and provide accurate results [16].

Table 7. Black Box Testing Results on Users

| Feature                   | Testing Scenario   | Result     |
|---------------------------|--|------------|
| Registration Page         | The pregnant woman registers by filling in personal data, such as email and password.                        | Successful |
| Login Page                | The pregnant woman logs in using a registered account.   | Successful |
| Main Page                 | Displays summary information and receives checkup schedule notifications and checkup results from the admin. | Successful |
| Contraction Exercise Page | The pregnant woman follows contraction exercises and contraction quizzes.                                    | Successful |
| Daily Journal Page        | The pregnant woman writes daily notes, saves, edits, and deletes entries.                                    | Successful |
| Health Tips Page          | The pregnant woman opens health tips, reads details through the "Read More" button.                          | Successful |
| Profile Page              | The pregnant woman changes her profile data, accesses language settings, and logs out.                       | Successful |

Table 8. Black Box Testing Results on Admin

| Feature                 | Testing Scenario   | Result     |
|-------------------------|--|------------|
| Login Page              | The Admin logs in using a registered account.                        | Successful |
| Main Page               | Displays the main admin page with the navigation menu.               | Successful |
| Medical Dictionary Page | The Admin adds new medical terms, edits, and deletes existing terms. | Successful |
| Checkup Schedule Page   | The Admin adds a checkup schedule for the pregnant woman.            | Successful |
| Checkup Results Page    | The Admin records notes on the checkup results.                      | Successful |

## IV. CONCLUSION

The Medical Guide and Healthy Lifestyle Application was successfully developed to support pregnant women in monitoring their health and accessing important information through features such as check-up schedule notifications, examination results, daily journals, contraction exercises, health tips, and a medical dictionary. Black Box Testing showed 100% success, with all 12 user test scenarios and 8 admin test scenarios functioning as expected, indicating that the application is stable and meets the intended requirements. Future research may include integrating electronic medical records, adding sensor-based health monitoring, developing more personalized recommendations, and conducting user testing on a larger scale to evaluate the application's long-term effectiveness. These enhancements are expected to increase the usefulness

of the application as a digital health education tool for pregnant women examimedical.

**Table 9.** User & Admin Testing Success Percentage

| Testing       | Total Scenario | Passed | Failed | Success Percentage |
|---------------|----------------|--------|--------|--------------------|
| User Testing  | 12             | 12     | 0      | 100%               |
| Admin Testing | 8              | 8      | 0      | 100%               |
| Overall Total | 20             | 20     | 0      | 100%               |

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