
FINAL YEAR PROJECT

Mom N Baby SmartCare



**GOVT. GRADUATE COLLEGE, CIVIL LINES,
SHEIKHUPURA**

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Project Advisor:

Hasan Raza

Session: **2022-2026**

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Bachelor of Science in Information Technology



FINAL YEAR PROJECT REPORT

Mom N Baby SmartCare

A project Presented to
Faculty of Computing and Information Technology (FCIT)
University of the Punjab
Lahore

In partial fulfillment of the requirements for the degree of
Bachelor of Science in Information Technology
Session (2022-2026)

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DECLARATION



Mom N Baby SmartCare

The work presented in this project has been carried out by us under the supervision of **Mr. Hasan Raza** at **Government Graduate College, Civil Lines, Sheikhupura**.

This project is the outcome of our own efforts, research, and understanding, completed in accordance with the academic guidelines provided by the institution.

We confirm that the content of this project is original and has not been copied from any published or unpublished source, except where proper references have been clearly acknowledged. Standard theories, models, formulas, and methodologies have been used only for academic support and have been appropriately cited.

Furthermore, we declare that this project has not been submitted previously, in whole or in part, for the award of any other degree, diploma or academic qualification at any institution.

The university may take appropriate action if the provided information is found to be inaccurate at any stage.

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Mom N Baby SmartCare

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This is to certify that **Syeda Nawal Naqvi (Roll#089318)** and **Sibgha Arfan (Roll#089315)** have prepared documentation for their final year project (FYP) titled **Mom N Baby SmartCare** at the **Department of Computer Science, Government Graduate College, Civil Lines, Sheikhpura**, in partial fulfillment of the requirements for the degree of **Bachelor of Sciences in Information Technology**.

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Acknowledgement



We would like to express our sincere thanks to **Prof. Hasan Raza, Lecturer at Government Graduate College, Civil Lines, Sheikhupura**, for her valuable guidance, encouragement and support during the preparation of our project documentation.

We are also thankful to our friends and families for their quiet support and motivation, which helped us stay focused throughout this phase of our work.

PROJECT INFORMATION



| | |
|------------------------|---|
| Project Title | Mom N Baby SmartCare |
| Objective | Objectives In Chat (You) |
| Undertaken by | Sibgha Arfan & Syeda Nawal Naqvi |
| Supervised by | Hasan Raza |
| Starting Date | 15/10/25 |
| Completion Date | |
| Tools Used | Visual Studio Code, Canva, Draw.io |
| Technologies | Java Programming Language Firebase Realtime Database Firebase Authentication Android SDK |



PREFACE

This is a final year project (FYP) report written by students of Bachelor of Science in Information Technology at the **University of the Punjab**. We are **Syeda Nawal Naqvi** and **Sibgha Arfan**, both of us are studying in BSIT (Hons) at **Government Graduate College, Civil Lines, Sheikhupura**.

To enable you to understand the idea of our project and the implementation process in detail and systematically, this report is divided into topics, each topic with a specific focus. We hope this approach allows you to read and understand our project report easily. Lastly, if you have any comments, you are welcome to contact us at:

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Abstract



Mom N Baby SmartCare

Mom N Baby SmartCare is a mobile application designed to help mothers in managing their own health and their baby's care in one place. The project proposal explains the purpose of the app, its goals and how it will make health management simple and organized for mothers. The SRS describes what the system can do, such as user registration and login, managing mother and baby profiles, tracking health details of Mother and baby, settings, reminders, selecting health schedules and receiving notifications. Health records are saved through mother and baby health trackers and graphs are generated to show health progress over time in a simple visual way. Notifications are automatically sent based on selected health schedules, while reminders can be added and managed independently by the user. The SDS explains how the system is designed and how different parts work together, and the prototype shows the main screens of the app, giving a clear idea of how the final application will look and work.

FYDP Overview

FYDP Title: Mom N Baby SmartCare



| Sr. No | Roll Numbers | Name | Signatures |
|--------|--------------|-------------------|------------|
| 1. | 089318 | Syeda Nawal Naqvi | |
| 2. | 089315 | Sibgha Arfan | |

Table: Project Proposal Summary

| |
|--|
| FYDP Goals: |
| ➤ Digital monitoring of mother and baby health records. |
| ➤ Track baby growth, vaccination, and mother health status. |
| ➤ Simple and user-friendly interface for mothers |
| ➤ Scheduled health reminders and notifications |
| FYDP Objectives: |
| ➤ Reduce manual record keeping and health data errors. |
| ➤ Digitally store and manage mother and baby medical information. |
| ➤ Provide timely reminders for vaccinations, checkups and care routines. |
| ➤ Ensure secure storage and reliability of health data. |
| FYDP Success Criteria: |
| This system will be considered successful if: |
| ➤ Mother and baby data is recorded accurately. |
| ➤ Email communication works effectively. |
| ➤ Online data synchronization functions smoothly. |
| ➤ Health notifications and reminders are delivered on time. |
| ➤ Health tracking improves monitoring efficiency. |
| Assumptions: |
| ➤ Users have access to a smartphone. |
| ➤ Users have basic knowledge of mobile application usage. |
| ➤ Internet access is available at least once within 24 hours. |
| ➤ Application is installed and configured correctly. |
| ➤ Users enter correct health information. |
| ➤ Users regularly check emails for health updates. |
| Risk and Obstacles: |
| ➤ Data loss due to device or storage failure. |



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| |
|---|
| ➤ Incorrect data entry affecting health records. |
| ➤ User hesitation in adopting digital health monitoring. |
| ➤ Network issues delaying synchronization and updates. |
| ➤ Limited device storage capacity. |
| Organization Address: Govt. Graduate College, Civil Lines, Sheikhupura |
| Target End Users: Mothers |
| Suggested Project Supervisor: Sir Hasan Raza |
| Approved By: |
| Date: 25-oct-2025 |

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Chapter No 1

Project Proposal



1.1 Introduction

This chapter gives an overview of the **Mom N Baby SmartCare** project. It explains the purpose of the application, the problem it solves and the goals of the system. The chapter also discusses the background of the project, the target user, project scope, assumptions, risks and the criteria used to measure the success of the application.

1.2 Background

Mothers handle many daily health responsibilities for themselves and their babies, including medicine schedules, baby care routines and regular health checkups. Many mothers depend on memory or handwritten notes to manage these tasks, which can easily result in missed medicines, forgotten appointments or incomplete health records. Most existing health applications are either too complicated to use or focus on only one area such as mother health or baby care. Therefore, there is a clear need for a simple and user-friendly mobile application that helps mothers manage both their own health and their baby's health in one place using a single profile.

1.3 Problem Statement

Mothers face difficulty in keeping track of their own health and their baby's health due to lack of a simple and organized system. Important activities like medicine intake, health schedules and routine care can be forgotten. There is no easy way to store health records and view progress in graphical form. This problem is common among mothers, especially new mothers and can affect daily care and wellbeing.

1.4 Stakeholders & Interest

| Stakeholder | Description | Interest / Need |
|-------------------------|--|---|
| Mothers (Primary Users) | Women who want to track their own health and manage their baby's health activities using a mobile application. | Easy health tracking, reminders, medical records, baby care management, and notifications in one app. |

Table 1 : Stakeholders & Interests

1.5 Objectives

The objectives of the system are:

- To provide a single application for mothers to manage their own and their baby's health.
- To allow entry of mother and baby data in one profile.
- To track health records and generate graphs,
- To send notifications based on selected health schedules.
- To allow mothers to set and manage reminders independently.
- To provide a simple, secure, and user-friendly mobile app.

1.6 Scope

The scope of the Mom N Baby SmartCare application is to help a mother manage her own health and her baby's health using a single mobile application. The app focuses on providing basic health-tracking features, such as recording blood pressure, glucose levels, weight, medical records, allergy information, baby milestones, and reminders. The mother can create and manage a single profile that contains both mother and baby information. The application also allows the user to receive notifications for selected health schedules, mark notifications as read and manage reminders easily. The system is limited to individual use and does not include direct interaction with doctors. All data is entered and managed manually by the mother and the app does not provide medical diagnosis or treatment suggestions. The application depends on email verification for account-related actions such as registration, email change and password change. A stable internet connection is required to use the application for registration via email verification, accessing data, and receiving notifications. The app is designed only for mothers and does not support multiple user roles.

1.7 Assumptions

The system is designed under several key assumptions that influence its functionality and overall design. It is assumed that users have access to a stable internet connection for registration, email verification, login, accessing health data and receiving notifications. Users are expected to have a valid email address for



registration and verification purposes and a mobile device that meets the minimum hardware and software requirements to run the application smoothly. It is also assumed that users will view and respond to notifications in a timely manner. Furthermore, the system relies on users entering accurate and truthful health data for effective tracking and recommendations. Lastly, users are expected to follow standard device security practices, including keeping their login credentials confidential.

1.8 Risks

The app requires a stable internet connection because weak or unavailable internet could prevent users from registering, accessing data or receiving notifications. Time constraints and limited resources could delay development and there is a risk of users entering incorrect health information or data being accessed without authorization. These risks can be managed through careful planning, validating user input and implementing strong security measures.

1.9 Success Criteria

| Feature | Description |
|--------------------------------------|---|
| User Registration and Authentication | Users can register using email verification and log in securely. |
| Core System Functionalities | Tracking mother and baby health, setting reminders, viewing health schedules and receiving notifications. |
| Data Management | Users can add, update, delete and view health records efficiently. |
| Reporting and Visualization | Health trends and progress are displayed through graphs and charts. |
| Search and Filter Options | Users can easily find specific records or schedules. |



| | |
|------------------------------|--|
| Speed and Responsiveness | The app responds quickly to user actions. |
| Data Privacy | User data is securely stored and protected. |
| Access Control | Only authorized users can access personal health information. |
| User Interface Design | The app is easy to navigate and user friendly. |
| Cross-Platform Compatibility | Works on Android and iOS devices. |
| Error Handling | The app displays clear messages when something goes wrong. |
| Third-Party Integration | Integrates with email services for verification and notifications. |
| Deployment Readiness | The app is fully functional and ready for release. |

Table 2: Project Success criteria

1.10. Tools, Libraries & Technologies

| | Tools | Version | Rational |
|--|----------------|----------|---|
| | Android Studio | 2025.2.3 | Official IDE for Android app development. Provides UI design tools, emulator, debugging support, and Gradle-based build system. |



| | | | |
|--|----------------------------|-------------------------------|--|
| Tools, Libraries And Technologies | MS Word | Office 2019 version (16.0) | Used for project documentation. Helps in creating, editing, and formatting reports with tables, diagrams, and screenshots. |
| | Git Hub | 3.1.2 | Help to store, manage and share code with others (Version Control, Team Collaboration). |
| | Canva | Web version (Latest) | Canva is used for simple designs. It helps to create diagrams, presentations, and images. It is easy to use with drag-and-drop tools. It works on all devices. |
| | Draw.io | 20.8.16 | It is a tool used for drawing. Use case diagrams, ER diagrams etc. Easy to use drag and drop interface and integrate with word. |
| | Libraries | Version | Rational |
| | Firebase Authentication | 22.3.1 | Used for user registration, login, email verification, password reset, and account deletion. |



| | | | |
|--|--|----------------|--|
| | Firestore Realtime Database / Firestore | 24.11.0 | Stores mother and baby profile data, health tracker data, records and schedules. |
| | Firestore Cloud Messaging (FCM) | 25.0.1 | Sends reminders and health schedule notifications to the user. |
| | Android Libraries | Latest | Provides backward compatibility, navigation, lifecycle management and UI components. |
| | Technology | Version | Rationale |
| | Java | JDK 17 | Main programming language for app logic and business rules. |
| | XML | Android SDK | Used to design UI layouts for all screens (Login, Home, Trackers, Settings, etc.). |
| | Firestore Authentication (Email Link Verification) | Latest | Ensures secure user access and verifies user identity via email links. |
| | Firestore Firestore / Realtime DB | Latest | Stores health data, profiles, records, reminders, and schedules in real time. |



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| | | | |
|--|-------------------------|-------------|---|
| | REST APIs (Firebase) | Latest | Enables communication between the app and Firebase services. |
| | SharedPreferences | Android SDK | Stores login session so returning users go directly to the Home screen. |

Table 3 Tools, Technologies and Libraries

1.11. Work Division

| Sr. No | Roll Number | Name | Role Assignment & Work Division |
|--------|-------------|-------------------|---|
| 1. | 089318 | Syeda Nawal Naqvi | Frontend & Backend Development, Documentation |
| 2. | 089315 | Sibgha Arfan | Frontend & Backend Development, Documentation |

Table 4: Project Team Members Work Division

1.12 Conclusion

This chapter presents a detailed overview of the Mom N Baby SmartCare project, describing its background, problem statement, objectives, scope, assumptions, risks, and success criteria. The chapter highlighted the need for a simple, user-friendly mobile application that allows mothers to manage both their own health and their baby's health within a single system.

The proposed solution aims to address the difficulties mothers face in organizing health records, remembering schedules, and tracking daily care activities. By combining mother and baby health tracking, reminders, notifications, medical records, and graphical reports into one platform, the system offers a practical and efficient way to support mothers in their daily responsibilities.

The scope, assumptions, and identified risks ensure that the system is realistic and feasible within the available resources and technical constraints. In addition, the success criteria provide measurable standards to evaluate the performance, usability,



Mom N Baby SmartCare

and reliability of the application. Overall, this chapter establishes a strong foundation for the design and development of the Mom N Baby SmartCare system. The next chapter will focus on the system analysis and design, including the functional requirements, system architecture, and UML diagrams that will guide the implementation of the application.



Chapter No 2

Literature Review

2.1 Literature Survey

The literature survey reviews mobile health systems related to mother and baby care, reminders, and digital health records. Mobile apps are widely used for health tracking and self-care support. Studies show that digital reminders help improve medication adherence and daily routine management. Maternal and infant care requires timely actions and proper record keeping, yet many mothers still rely on memory or paper notes, leading to missed tasks. Integrated systems that combine records, reminders and graphs make health tracking easier and more motivating. However, most existing apps focus on either the mother or the baby, not both together.

2.2 Related Work

Many mobile applications and research systems already exist in this domain. Popular market applications such as BabyCenter provide baby development tracking and care tips, Glow Baby focuses on baby growth tracking and reminders, and Google Fit supports general health tracking. Although these applications are helpful, they have several limitations. Most of them focus on either the mother or the baby rather than managing both together. They often have complex user interfaces that are difficult for new users, lack integrated records for both users, and provide limited or no graphical reports. In addition, reminder customization is poor, and there is no single unified section for medical records and graphs, which reduces overall usability and effectiveness.

2.3 Gap Analysis

| Aspect | Existing Systems | Identified Gap | Proposed Solution (Mom N Baby SmartCare) |
|-----------------|-----------------------------------|---------------------------|--|
| User Coverage | Separate apps for mother and baby | No single system for both | One app with a single profile for mother and baby |
| Health Tracking | Limited to specific health areas | Incomplete tracking | Tracks glucose, BP, weight, allergy, milestones, and medical |



| | | | |
|-------------------|------------------------------------|--------------------------|--|
| | | | records |
| Record Management | Stored separately or not available | No unified record system | Centralized records for both mother and baby |
| Graphical Reports | Limited or no charts | Lack of visualization | Interactive graphs for all health data |
| Reminder System | Basic or fixed reminders | No custom scheduling | User-defined reminders and health schedules |
| Notifications | Not always reliable | No real-time alerts | Firebase Cloud Messaging notifications |
| Usability | Complex interfaces | Not beginner friendly | Simple, clean, easy to use design |
| Data Security | Weak or unclear | Privacy concerns | Secure login, email verification and Firebase security |
| Integration | Single feature apps | No unified platform | All features combined in one system |

Table 5: Gap Analysis

2.4 Summary

This chapter reviewed existing research, mobile health applications, and digital healthcare systems. While many solutions exist, most lack integration, simplicity and combined tracking for both mother and baby. The gap analysis shows the need for a unified and easy to use system. The proposed Mom N Baby SmartCare application addresses these limitations by offering a single platform that supports health tracking, records, reminders and notifications for both mother and baby.



Chapter No 3

Software Requirements Specification

3.1 Requirements Analysis

This section presents the requirements analysis for the mother & baby health app. The main objective is to understand the needs and expectations of the primary user, ensuring the system supports her in managing her health and her baby's health efficiently. This includes adding and updating profile information, using health trackers, viewing records and graphs, setting reminders, and customizing notifications.

3.2 User Class and Characteristics

| User Class | Pertinent Characteristics |
|------------|---|
| Mother | The mother is the main user of the Mom N Baby SmartCare app. She wants a simple, organized way to take care of her health and her baby's daily needs. The app should be easy to use and help with basic tasks like signing up, logging in and updating her profile. Every day, she relies on reminders, notifications and a clear home screen to stay organized. She also needs a simple way to record and manage health information for herself and her baby, with the ability to view, update or delete records and log out safely. |

Table 6: User Classes

3.3 Requirement Identifying Technique

The following techniques were used to identify the requirements of the **Mom N Baby SmartCare** application:

Observation Technique

- Observation was used as a primary requirement-gathering technique.
- We observed that mothers usually maintain baby health records, vaccination schedules, and growth details manually, which can be confusing, time-consuming, and prone to loss or errors.
- Based on these observations, a digital solution was proposed to manage mother and baby health records, reminders, and notifications in one place.
- This technique helped identify real-world problems and areas where digital automation could improve healthcare management.

Questionnaire Technique

- Informal discussions and questionnaires were conducted to understand their needs and expectations.
- The responses helped identify required features such as profile management, health tracking, vaccination reminders, and notification alerts.
- This technique ensured that the system addresses practical user requirements.

Use Case Modelling

- Use case diagrams were prepared to identify interactions between users (mothers) and the system.
- This helped define core functionalities such as registration, login, health record management, reminder setup, and notifications.
- Use case modeling clarified system behavior from the user's perspective.

User Interaction Analysis

- Storyboards and use case diagrams were used to analyze how users interact with the application.
- This ensured a smooth user experience with clear navigation and easy access to health tracking features.
- The analysis helped design an interface that is simple, intuitive, and suitable for everyday use by mothers.

3.4 User Class and Characteristics

Storyboarding is used to visually represent the sequence of events and navigation flow of the application. It helps in understanding how the user interacts with the system across different screens.

The storyboard illustrates:

- App launch screen
- Registration
- Login
- Home page navigation
- Profile creation (mandatory)
- Access to mother and baby health trackers
- Data entry screens
- Records and graphs navigation
- Reminder
- Health schedule



- Receiving Notification
- Settings
- Logout

Storyboarding helps show how the screens in the app change, how the user moves through the app and the order of actions. This makes it easier to check that the app works as expected and ensures it is simple and easy to use.

3.5 Functional Requirements:

The functional requirements of the Mom N Baby SmartCare system explain what the system will do. The requirements are organized by system features. Each functional requirement is uniquely identified to ensure clarity and consistency.

FR-1: User Registration

- **Description:**
The mother shall be able to register an account by providing a username, a valid email address, a password and a confirmation password. The system shall validate the inputs and send an email verification link.
- **Input:**
Username, email address, password, confirm password
- **Output:**
Account created message, verification email sent

FR-2: Email Verification

- **Description:**
The system shall send a verification email and activate the account only after the user clicks the verification link.
- **Input:**
Verification link click
- **Output:**
Account activated confirmation



FR-3: User Login

- **Description:**

The mother shall be able to log in to the application using her registered and verified email address and password. The system shall authenticate the credentials and grant access to the home screen if the details are correct.

- **Input:**

Registered email address, password

- **Output:**

Successful login message, home screen displayed

FR-4: Forgot Password

- **Description:**

The mother shall be able to reset her password by entering her registered email address. The system shall send a verification link and allow password reset.

- **Input:**

Registered email address

- **Output:**

Password reset email verification link sent, password updated

FR-5: Manage Mom And Baby Profile

- **Description:**

The mother can add, view and update both her own profile and her baby's profile in one place. She can also delete her account from the Profile section whenever she wants.

- **Input:**

Mother's name, mother's age, Baby's name, Baby's date of birth

- **Output:**

Mom and baby profile saved, updated or deleted



FR-6: Manage Mother Health Tracker

- **Description:**

The system shall allow the mother to add, view, update and delete her health data.

- **Input:**

Blood pressure, glucose level, weight, mother medical record

- **Output:**

Saved, updated health records, viewed or deleted mother health tracker data

FR-7 Manage Baby Health Tracker

- **Description:**

The system shall allow the mother to add, view, update and delete baby health data.

- **Input:**

Baby weight, allergies, milestones and medical records

- **Output:**

Saved, updated health records, viewed or deleted baby health tracker data

FR-9: Reminder Management

- **Description:**

The mother shall be able to add, edit, view and delete reminders.

- **Input:**

Reminder title, date, time

- **Output:**

Reminder created, updated or deleted

FR-8: Records and Graphs Visualization

- **Description:**

The system shall display health records and generate visual graphs for mother and baby health data.

- **Input:**

Stored health data

- **Output:**
Records list, visual graphs

FR-9: Manage Health Schedule

- **Description:**
The system shall allow the mother to select and manage health schedules.
- **Input:**
Selected schedule type
- **Output:**
Schedule activated or deactivated

FR-10: Receiving Notifications

- **Description:**
The system shall send notifications for selected health schedules.
- **Input:**
Selected health schedules
- **Output:**
Push notifications displayed

FR-11: Settings Management

- **Description:**
The mother shall be able to change email, password and theme. Email and password changes require email link verification.
- **Input:**
New email, new password, theme choice
- **Output:**
Settings updated confirmation

FR-12: Logout

- **Description:**
The mother shall be able to log out of the application securely.
- **Input:**
Logout button click

- **Output:**

Session ended, App closes

Functional Requirement X

| Attribute | Description |
|----------------------|--|
| Identifier | FR-1 |
| Title | User Registration |
| Requirement | The mother shall be able to register an account by providing a username, valid email address, password, and confirm password. The system shall validate all inputs and send an email verification link upon successful submission. |
| Source | Project stakeholder |
| Inputs | Username, email address, password, confirm password |
| Destination | Data stored in database; confirmation displayed on screen |
| Outputs | Account created message, verification email sent |
| Rationale | Allows secure user registration and ensures email authenticity. |
| Business Rule | One email address can be registered with only one account. |
| Dependencies | None |
| Priority | High |

Table 7: Function Requirement FR-1

| Attribute | Description |
|--------------------|--|
| Identifier | FR-2 |
| Title | Email Verification |
| Requirement | Upon registration, the system shall send a verification email and activate the account only after the user clicks the verification link. |
| Source | Security requirements |
| Inputs | Verification link click |



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| | |
|----------------------|--|
| Destination | Account status stored in database; message displayed |
| Outputs | Account activated confirmation |
| Rationale | Prevents fake accounts and ensures security. |
| Business Rule | Verification link must expire after a defined time. |
| Dependencies | FR-1 |
| Priority | High |

Table 8: Function Requirement FR-2

| Attribute | Description |
|----------------------|---|
| Identifier | FR-3 |
| Title | User Login |
| Requirement | The mother shall be able to log in using a verified email and password. The system shall authenticate the credentials and redirect the user to the home screen. |
| Source | Verified email |
| Inputs | Email, password |
| Destination | Session stored; home screen displayed |
| Outputs | Successful login message, home screen |
| Rationale | Provides secure access to the application. |
| Business Rule | Invalid credentials shall display an error message. |
| Dependencies | FR-2 |
| Priority | High |

Table 9: Function Requirement FR-3



| Attribute | Description |
|----------------------|--|
| Identifier | FR-4 |
| Title | Forgot Password |
| Requirement | The mother shall be able to reset her password by entering her registered email. The system shall send a verification link and allow password reset. |
| Source | Registered email |
| Inputs | Email address |
| Destination | Password updated in database |
| Outputs | Password reset link, password updated |
| Rationale | Enables account recovery. |
| Business Rule | Password reset must follow email verification. |
| Dependencies | FR-2 |
| Priority | High |

Table 10: Function Requirement FR-4

| Attribute | Description |
|----------------------|--|
| Identifier | FR-5 |
| Title | Manage Mom & Baby Profile |
| Requirement | The mother shall be able to add, view, edit, and delete her own profile and her baby's profile in one place. |
| Source | Mother |
| Inputs | Mother name, age; baby name, date of birth |
| Destination | Stored in database; displayed on screen |
| Outputs | Profiles saved, updated or account deleted |
| Rationale | Maintains accurate health records. |
| Business Rule | Baby DOB must be a valid past date or current date |
| Dependencies | FR-3 |
| Priority | High |

Table 11: Function Requirement FR-5



| Attribute | Description |
|---------------------|---|
| Identifier | FR-6 |
| Title | Mother Health Tracker |
| Requirement | The system shall allow the mother to add, view, update, and delete her health data. |
| Source | Mother |
| Inputs | Blood pressure, glucose level, weight, medical record |
| Destination | Stored and displayed |
| Outputs | Health records saved, updated, viewed or deleted |
| Rationale | Supports health monitoring. |
| Dependencies | FR-3, FR-5 |
| Priority | High |

Table 12: Function Requirement FR-6

| Attribute | Description |
|---------------------|--|
| Identifier | FR-7 |
| Title | Baby Health Tracker |
| Requirement | The system shall allow the mother to add, view, update, and delete baby health data. |
| Source | Mother |
| Inputs | Weight, allergies, milestones, medical records |
| Destination | Stored and displayed |
| Outputs | Baby health records saved, updated, viewed or deleted |
| Rationale | Tracks baby growth. |
| Dependencies | FR-3, FR-5 |
| Priority | High |

Table 13: Function Requirement FR-7

| Attribute | Description |
|--------------------|---|
| Identifier | FR-8 |
| Title | Reminder Management |
| Requirement | The mother shall be able to add, edit, view and delete reminders. |



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| | |
|---------------------|------------------------------------|
| Source | Mother |
| Inputs | Reminder title, date, time |
| Destination | Stored and notified |
| Outputs | Reminder created, updated, deleted |
| Rationale | Ensures timely care. |
| Dependencies | FR-3 |
| Priority | High |

Table 14: Function Requirement FR-8

| Attribute | Description |
|---------------------|---|
| Identifier | FR-9 |
| Title | Records and Graphs |
| Requirement | The system shall display records and generate visual graphs for mother and baby data. |
| Source | Mother |
| Inputs | Stored health data |
| Destination | Visual display |
| Outputs | Records list, graphs |
| Rationale | Shows health trends. |
| Dependencies | FR-6, FR-7 |
| Priority | Medium |

Table 15: Function Requirement FR-9

| Attribute | Description |
|--------------------|--|
| Identifier | FR-10 |
| Title | Manage Health Schedule |
| Requirement | The system shall allow the mother to view, select, activate, deactivate, and manage health schedules related to mother and baby care routines. |
| Source | Mother |
| Inputs | Selected schedule type |
| Destination | Schedule data stored in database; status displayed on screen |



| | |
|----------------------|---|
| Outputs | Schedule activated or deactivated confirmation |
| Rationale | Helps organize daily and periodic health activities. |
| Business Rule | Only one schedule of the same type can be active at a time. |
| Dependencies | FR-3 |
| Priority | Medium |

Table 16: Function Requirement FR-10

| Attribute | Description |
|----------------------|--|
| Identifier | FR-11 |
| Title | Receiving Notifications |
| Requirement | The system shall send notifications to the mother for selected health schedules, reminders, and important health-related alerts. |
| Source | Mother |
| Inputs | Selected health schedules |
| Destination | Notification displayed on mobile device |
| Outputs | Push notifications displayed |
| Rationale | Keeps the user informed in real time. |
| Business Rule | Notifications shall be sent only for active schedules and reminders. |
| Dependencies | FR-8, FR-10 |
| Priority | High |

Table 17 : Functional Requirement FR-11

| Attribute | Description |
|--------------------|--|
| Identifier | FR-12 |
| Title | Settings Management |
| Requirement | The mother shall be able to change her email address, password, and application theme. Email and password changes shall require verification through an email link before being saved. |
| Source | Use case diagram |



| | |
|----------------------|--|
| Inputs | New email, new password, theme choice |
| Destination | Settings stored in database; confirmation displayed |
| Outputs | Settings updated confirmation |
| Rationale | Allows secure and personalized account management. |
| Business Rule | Email and password changes must be verified through email before activation. |
| Dependencies | FR-2, FR-3 |
| Priority | Medium |

Table 18: Function Requirement FR-12

| Attribute | Description |
|----------------------|---|
| Identifier | FR-13 |
| Title | Logout |
| Requirement | The mother shall be able to log out of the application securely, and the system shall terminate the active session. |
| Source | Use case diagram |
| Inputs | Logout button click |
| Destination | Session closed; login screen displayed |
| Outputs | Session ended, application closed |
| Rationale | Protects user data when the application is not in use. |
| Business Rule | Active session must be cleared on logout. |
| Dependencies | FR-3 |
| Priority | High |

Table 19: Function Requirement FR-13

3.6 Non-Functional Requirements:

Mom N Baby SmartCare defines quality requirements that explain how the application will work smoothly, safely and reliably. These requirements focus on system behavior, performance, and user experience rather than features.

1. Reliability:

Mom N Baby SmartCare is designed to work smoothly and reliably during normal use. If the app ever stops working unexpectedly, it will recover on its own and continue functioning without



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losing important information. All essential data, including health records, reminders and profiles, will be kept safe even during crashes or sudden shutdowns. The system will automatically create regular backups to protect user information and maintain high data accuracy and integrity, so the mother can trust that her data is always secure.

2. Usability:

Mom N Baby SmartCare shall be easy to learn and simple to use for mothers with basic mobile phone knowledge. New users shall be able to register and log in effortlessly. Frequent tasks, such as adding mother and baby health information, creating reminders, or accessing records, shall be quick. The interface will be clear, simple and designed to minimize user mistakes.

3. Performance:

Mom N Baby SmartCare will perform smoothly during normal operations. Actions such as login, data entry, viewing profiles and opening health records shall be completed within 3 seconds under normal mobile internet conditions. The app shall run without freezing or noticeable delays during regular use.

4. Response Time:

Mom N Baby SmartCare will respond quickly to user actions. Opening screens, saving data, updating settings and viewing graphs shall take 2 to 3 seconds. Reminders and notifications will be delivered at the correct time in less than 1 minute.

5. Security:

Mom N Baby SmartCare will protect user data from unauthorized access. Only registered and logged in users shall access personal and health information. Important actions such as changing passwords or email addresses will require email verification. User data shall remain private and secure at all times.

6. Backup:

Mom N Baby SmartCare will automatically back up user data after 24 hours.

7. Availability:

Mom N Baby SmartCare will be available 99% of the time. Users shall be informed in advance if the system is temporarily unavailable.

8. Maintainability:

Mom N Baby SmartCare shall be built in a modular way so that updates and improvements, including bug fixes and new features, can be applied automatically without affecting existing functions such as health tracking, reminders, or profile management.

9. Compatibility:

Mom N Baby SmartCare will work properly on common Android devices and shall support different screen sizes, ensuring a consistent and smooth user experience.

3.7 External Interface Requirements:

Mom N Baby SmartCare defines external interface requirements to ensure that the



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application communicates correctly with users and any external software, hardware or communication services. These requirements describe how users interact with the system and how the system connects with external components.

3.7.1 User Interface Requirements

Mom N Baby SmartCare provides a **simple, clear, and user-friendly interface** designed for mothers with basic smartphone knowledge. The interface follows standard mobile and Android GUI guidelines to ensure consistency and ease of use.

The following user interface characteristics are included:

- **Fonts and Text:** Clear, readable fonts and appropriate text sizes for long usage.
- **Icons and Buttons:** Simple, meaningful icons and button labels for easy navigation. Standard buttons such as **Home, Back, Save, Logout**, and shortcuts are included where needed.
- **Color Scheme and Images:** Soft, comfortable colors with relevant images that are easy to understand.
- **Screen Layout:** Supports common Android screen sizes and resolutions to ensure proper layout across devices.
- **Message Display:** Clear messages for successful actions, errors, reminders, and notifications. Error messages are simple and guide the user on correcting mistakes.
- **Consistency and Accessibility:** Screen layouts are consistent to support future localization. Readable fonts and clear contrast are used to improve visibility for all users.

3.7.2 Software Interfaces

Mom N Baby SmartCare interacts with external software components to support its functionality:

- **Backend Server & Database:** Stores mother and baby profiles, health records, reminders, and notifications.
- **Operating System:** Runs on the Android OS using standard Android libraries and services.
- **Notifications:** Integrates with Android notification services to provide alerts to users.

3.7.3 Hardware Interfaces

Mom N Baby SmartCare operates on standard Android smartphones and tablets. The application interacts with:

- **Touchscreen:** For user input.
- **Internal Storage:** Used only for temporary caching of data during use. All permanent data is stored on the online server; the app does not maintain a local database.



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The system does **not require any special external hardware** for normal operation. Internet connectivity is required for full functionality, including accessing health records, reminders, and profile information.

3.7.4 Communications Interfaces

Mom N Baby SmartCare supports the following communication functions:

- **Email:** Used for account verification and password reset.
- **Network Protocols:** Standard HTTP/HTTPS connections for server communication.
- **Push Notifications:** Delivered through Android notification services.

3.8 Use Case Analysis:

Mom N Baby SmartCare use case analysis explains how users interact with the system to achieve specific goals. Each use case describes the purpose, flow, and conditions of a particular system function.

Use Case #1 (Registration UC-1)

| Attribute | Description |
|---------------------------|--|
| UC Identifier | UC1 |
| UC Name | Register Account |
| Requirements Traceability | FR-1: User Registration, FR-2: Email Verification |
| Purpose | To allow the mother to create a new account in Mom N Baby SmartCare and ensure the email is verified for security. |
| Priority | High |
| Preconditions | The mother has installed the app and has an active internet connection. |
| Postconditions | A new account is created, verified and ready for login. |
| Actors | Mother (user) |
| Extends | None |



| | |
|------------------------------|---|
| Main Success Scenario | <ol style="list-style-type: none"> 1. The mother opens the registration page. 2. The mother enters a username, valid email, password and confirms the password. 3. The system validates inputs. 4. The system sends a verification email to the provided address. 5. The mother clicks the verification link in the email. 6. The system confirms account activation. |
| Alternate Flows | If the email is already registered, the system displays an error message. If the password and confirm password do not match, the system prompts the user to re enter. |
| Exceptions | Email server fails to send verification link. Invalid email format entered. |
| Includes | None |

Table 20: Use case UC-1

Use Case #2 (Login UC-2)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-2 |
| UC Name | Login |
| Requirements Traceability | FR-3: User Login |
| Purpose | Allow the mother to access her account securely. |
| Priority | High |
| Preconditions | Mother has a verified account |
| Postconditions | Mother successfully logged in and was redirected to the home screen |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | <ol style="list-style-type: none"> 1. The mother opens the login page. 2. She enters her email and password. 3. After authentication, she access home screen 4. In case she forgot her password, she can reset it. |



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| | |
|------------------------|-------------------------------|
| Alternate Flows | User chooses Forgot Password. |
| Exceptions | Server down, network issues |
| Includes | UC-3 (Forgot Password) |

Table 21: Use case UC-2

Use Case #3 (Forgot Password UC-3)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-3 |
| UC Name | Forgot Password |
| Requirements Traceability | FR-4: Forgot Password |
| Purpose | Enable the mother to reset her password securely. |
| Priority | High |
| Preconditions | Mother has a registered account |
| Postconditions | Password reset and updated |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother selects Forgot Password. 2. Mother enters email. 3. System verifies email. 4. Mother enters new password. 5. System updates password |
| Alternate Flows | Email verification is delayed. |
| Exceptions | Email server failure |
| Includes | Verify Email |

Table 22: Use case UC-3

Use Case #4 (Mom And Baby Profile UC-4)

| Attribute | Description |
|----------------------|-----------------------------------|
| UC Identifier | UC-4 |
| UC Name | Mom And Baby Profile |
| Requirements | FR-5: Manage Mom And Baby Profile |



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| | |
|------------------------------|--|
| Traceability | |
| Purpose | Allow the mother to maintain her profile and her baby's profile. |
| Priority | High |
| Preconditions | Mother logged in |
| Postconditions | Profiles saved, updated or deleted |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | <ol style="list-style-type: none"> 1. Mother opens profile section. 2. System displays mom and baby details. 3. Mother edits information. 4. System saves updated profile. |
| Alternate Flows | Mother only views profile. |
| Exceptions | System fails to save data |
| Includes | View Profile, Edit Profile |

Table 23: Use case UC-4

Use Case #5 (Reminder Management UC-5)

| Attribute | Description |
|----------------------------------|---|
| UC Identifier | UC-5 |
| UC Name | Reminder Management |
| Requirements Traceability | FR-8: Reminder Management |
| Purpose | Allow the mother to manage reminders for medicines or baby care tasks. |
| Priority | High |
| Preconditions | Mother logged in |
| Postconditions | Reminder added, updated or deleted successfully |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | <ol style="list-style-type: none"> 1. Mother opens reminders. 2. Mother adds reminder. 3. System schedules notification. |
| Alternate Flows | Reminder edited or deleted. |



| | |
|-------------------|----------------------------|
| Exceptions | Invalid date or time. |
| Includes | Add, Edit, Delete Reminder |

Table 24 Use case UC-5

Use Case #6 (Mother Health Tracker UC-6)

| Attribute | Description |
|----------------------------------|---|
| UC Identifier | UC-6 |
| UC Name | Mother Health Tracker |
| Requirements Traceability | FR-6: Manage Mother Health Tracker |
| Purpose | Allow the mother to track and update her health data. |
| Priority | High |
| Preconditions | Mother logged in |
| Postconditions | Health records added, updated, or deleted successfully |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | <ol style="list-style-type: none"> 1. Mother opens Mother Health Tracker. 2. Mother adds health details (weight, BP, glucose). 3. System saves data. |
| Alternate Flows | Mother edits or deletes existing data. |
| Exceptions | Invalid data entry. |
| Includes | None |

Table 25 Use case UC-6

Use Case #7 (Baby Health Tracker UC-7)

| Attribute | Description |
|----------------------------------|---|
| UC Identifier | UC-7 |
| UC Name | Baby Health Tracker |
| Requirements Traceability | FR-8: Manage Baby Health Tracker |
| Purpose | Allow the mother to track and update baby health records. |
| Priority | High |



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| | |
|------------------------------|--|
| Preconditions | Mother logged in; baby profile exists |
| Postconditions | Baby health records added, updated, or deleted |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother opens Baby Health Tracker. 2. Mother adds health information. 3. System saves records. |
| Alternate Flows | Mother updates or deletes records. |
| Exceptions | Missing or incorrect data. |
| Includes | None |

Table 26: Use case UC-7

Use Case #8 (Records and Graphs UC-8)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-8 |
| UC Name | Records and Graphs |
| Requirements Traceability | FR-9: Records and Graphs |
| Purpose | Allow mother to track and view health records visually. |
| Priority | Medium |
| Preconditions | Mother logged in; health data exists |
| Postconditions | Health records updated and visual graphs displayed |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother views/edits health records 2. System saves updates 3. System generates graphs for trends |
| Alternate Flows | Incorrect data |
| Exceptions | Server or graph generation failure |
| Includes | None |

Table 27: Use case UC-8

Use Case #9 (Health Schedule UC-9)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-9 |
| UC Name | Health Schedule |
| Requirements Traceability | FR-10: Manage Health Schedule |
| Purpose | Allow the mother to select and manage daily or periodic health schedules. |
| Priority | Medium |
| Preconditions | Mother logged in |
| Postconditions | Health schedules activated or deactivated |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother selects/deselects schedule 2. System saves choice 3. Schedule status updated |
| Alternate Flows | Schedule conflict |
| Exceptions | Failure to save schedule |
| Includes | None |

Table 28 Use case UC-9

Use Case #10 (Receiving Notifications UC-10)

| Attribute | Description |
|----------------------------------|---|
| UC Identifier | UC-10 |
| UC Name | Receiving Notifications |
| Requirements Traceability | FR-11: Notifications |
| Purpose | Notify the mother about schedules, reminders or important alerts. |
| Priority | High |
| Preconditions | Mother logged in; schedules/reminders exist |
| Postconditions | Notifications displayed and marked as read if viewed |



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| | |
|------------------------------|---|
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. System sends notification 2. Mother views and optionally marks as read 3. System updates notification status |
| Alternate Flows | Missed or delayed notification |
| Exceptions | Network failure, push notification service failure |
| Includes | None |

Table 29 Use case UC-10

Use Case #11 (Settings UC-11)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-11 |
| UC Name | Settings |
| Requirements Traceability | FR-12: Settings Management |
| Purpose | Allow the mother to manage account settings like email, password, and theme. |
| Priority | Medium |
| Preconditions | Mother logged in |
| Postconditions | Settings updated successfully |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother updates email/password/theme 2. System validates changes 3. Settings updated |
| Alternate Flows | Incorrect old password, Invalid email |
| Exceptions | Verification email fails to send |
| Includes | None |

Table 30 Use case UC-11



Use Case #12 (Logout UC-12)

| Attribute | Description |
|----------------------------------|--|
| UC Identifier | UC-12 |
| UC Name | Logout |
| Requirements Traceability | FR-13: Logout |
| Purpose | Allow the mother to securely log out from the app. |
| Priority | High |
| Preconditions | Mother logged in |
| Postconditions | Session terminated, home/login screen displayed |
| Actors | Mother |
| Extends | None |
| Main Success Scenario | 1. Mother clicks logout 2. System ends session 3. Login screen displayed |
| Alternate Flows | None |
| Exceptions | Session fails to terminate properly |
| Includes | None |

Table 31 Use case UC-12

Use Case Diagram

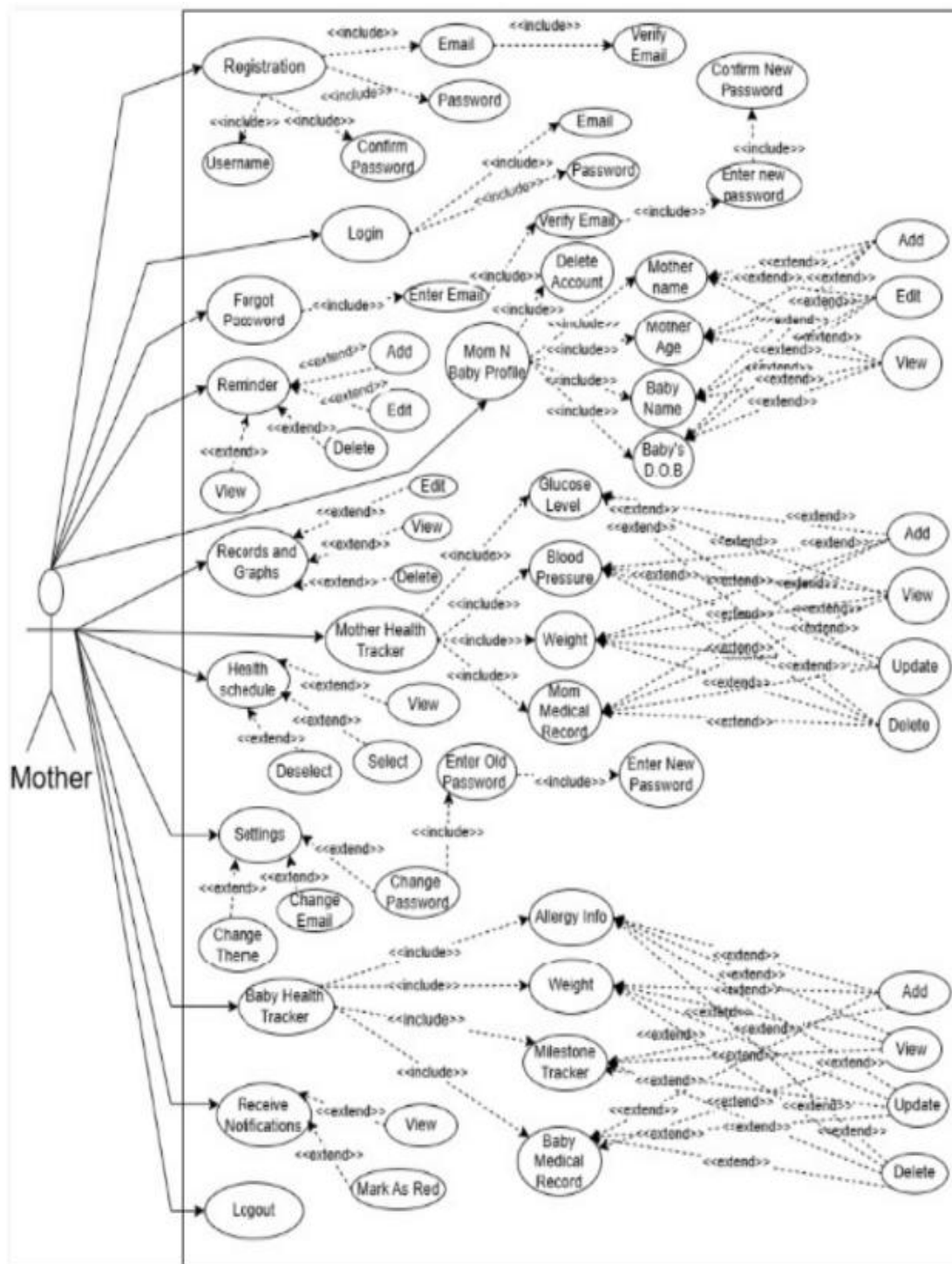


Figure 1 Use case diagram

3.9 Storyboards:

Storyboard 1

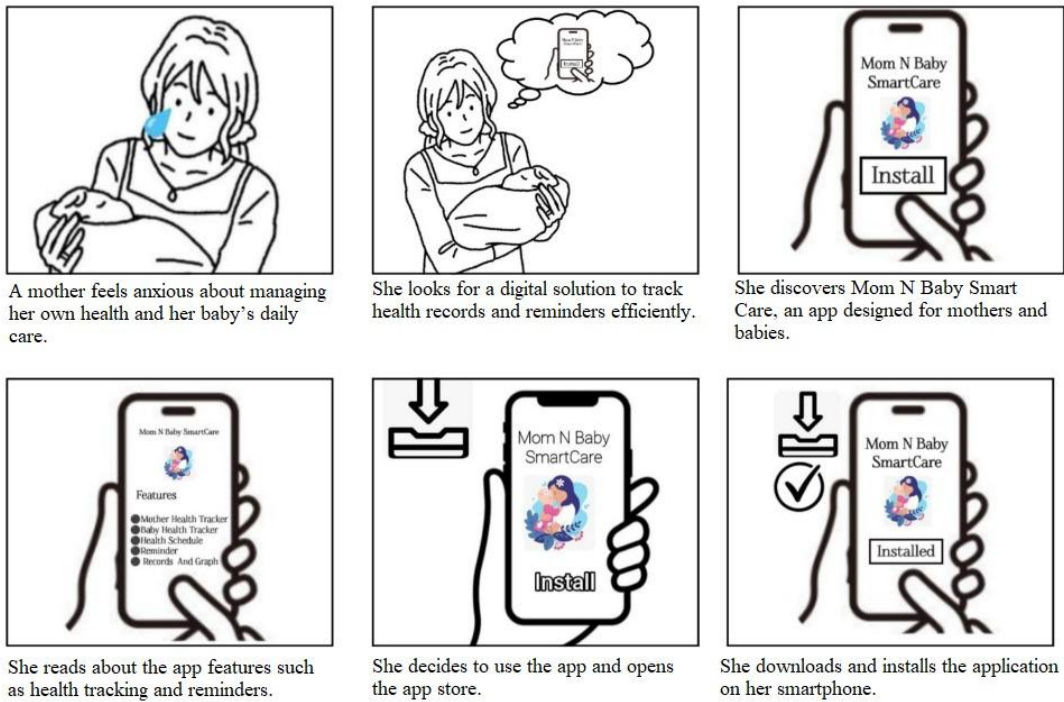


Figure 2 Storyboard 1

Storyboard 2

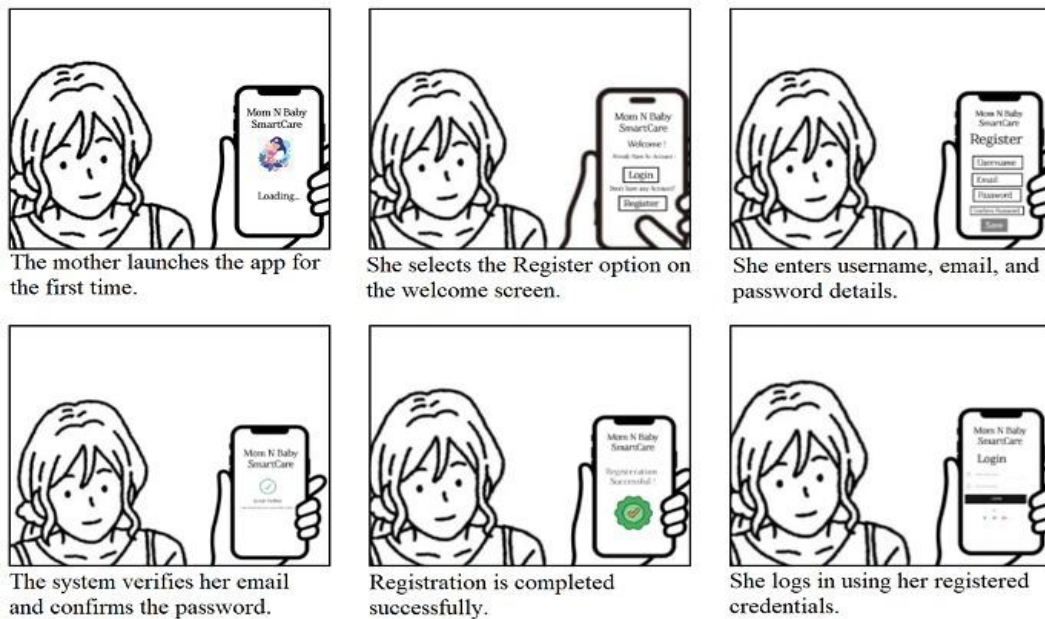


Figure 3 Storyboard 2

Storyboard 3

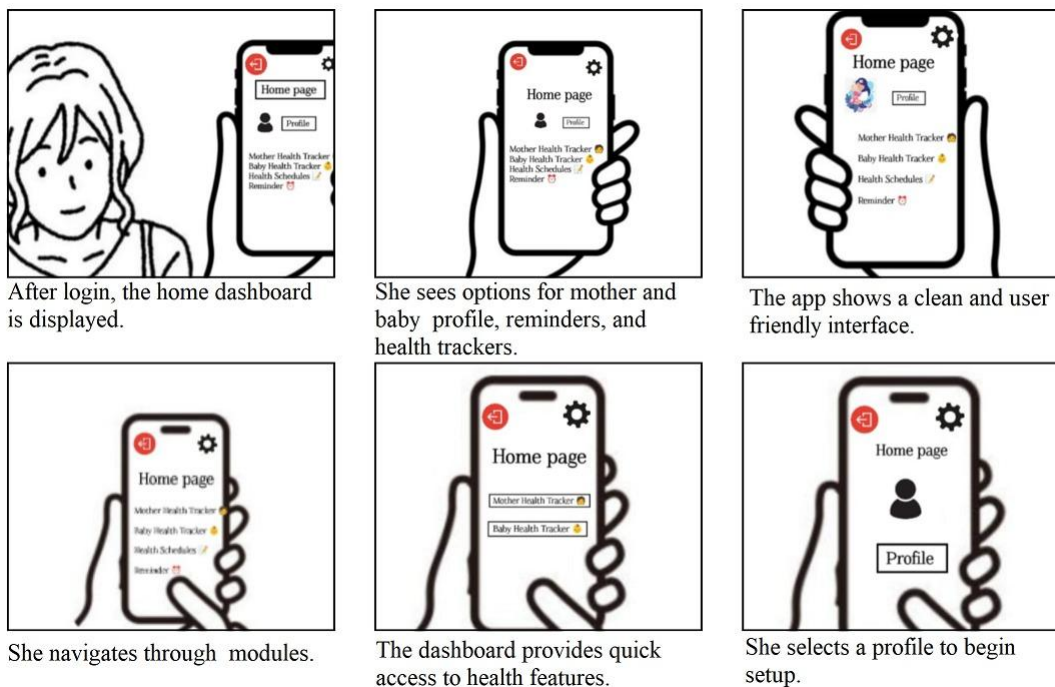


Figure 4 Storyboard 3

Storyboard 4

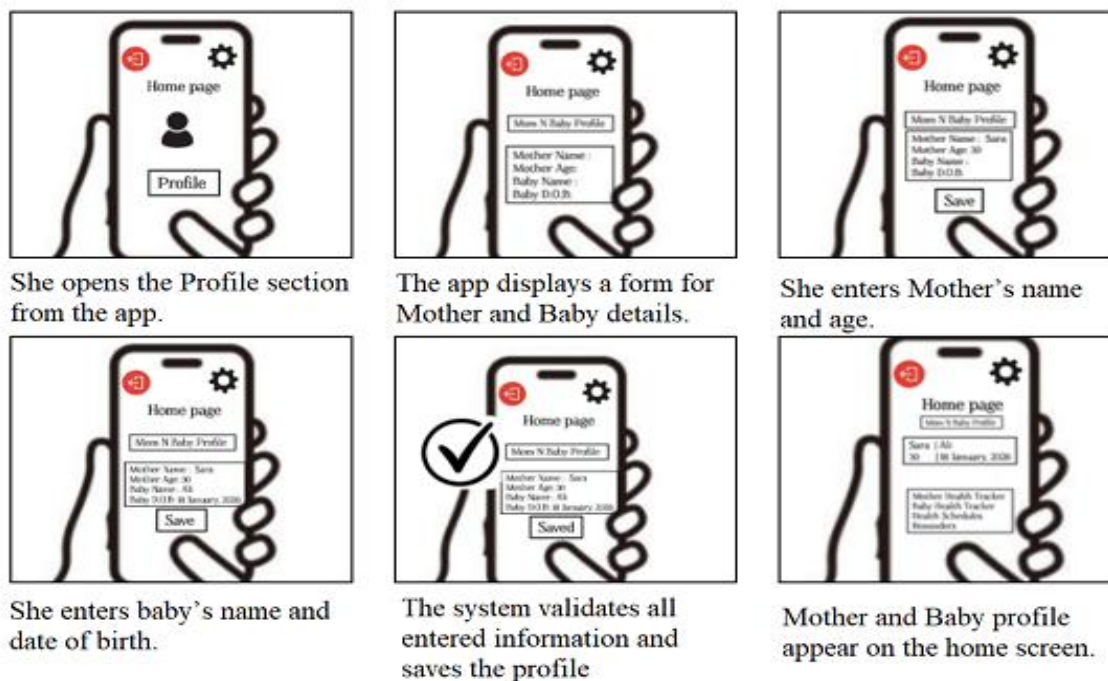


Figure 5 Storyboard 4

Storyboard 5

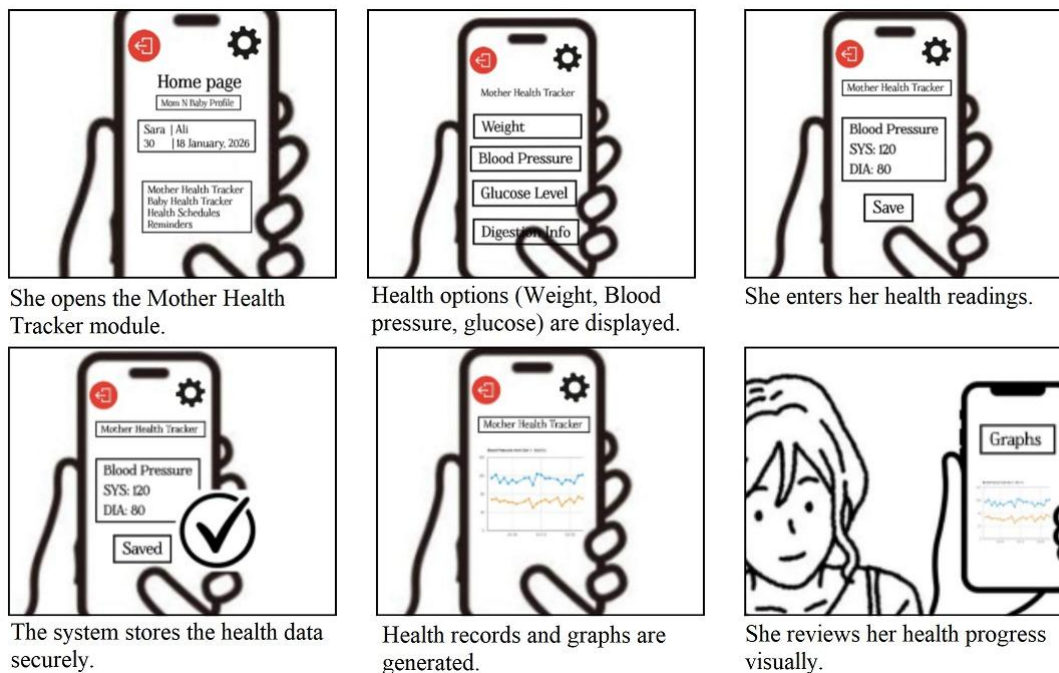


Figure 6 Storyboard 5

Storyboard 6

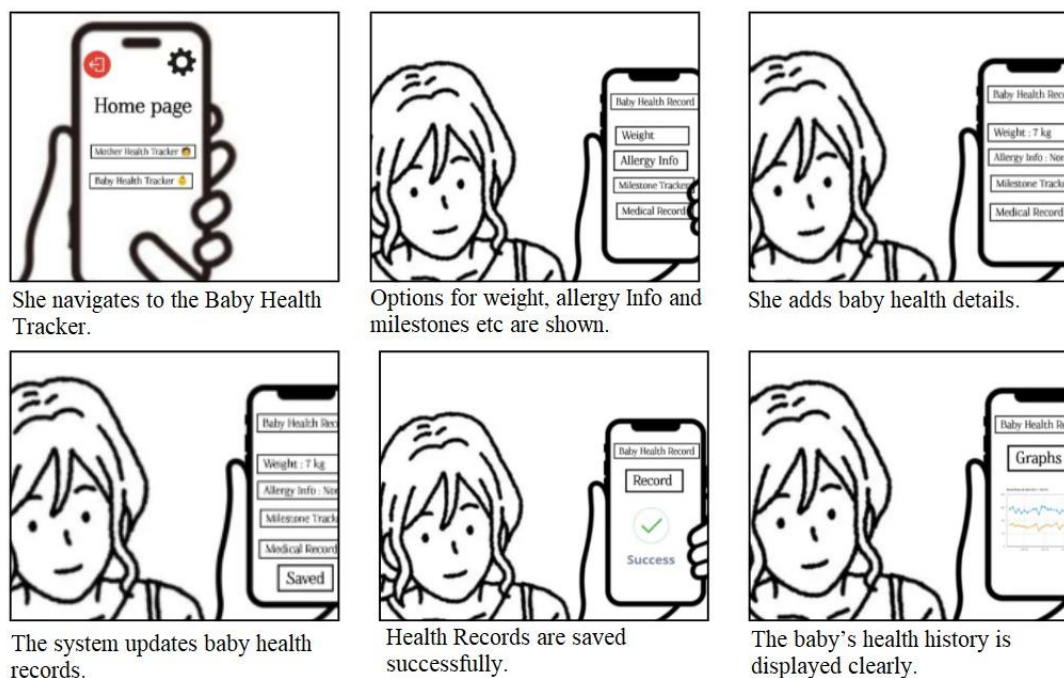


Figure 7 Storyboard 6

Storyboard 7

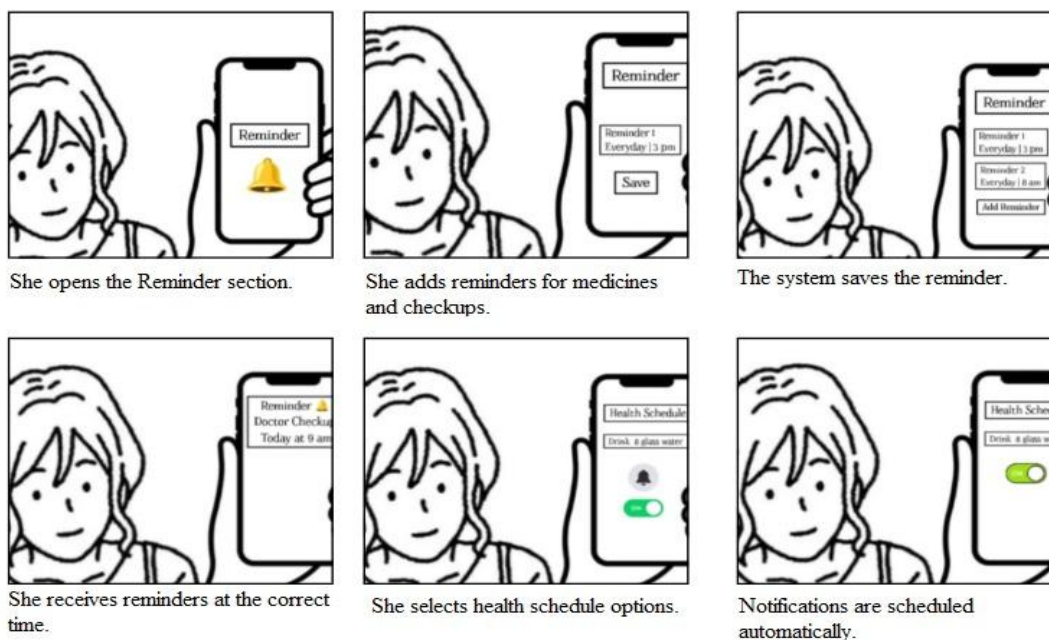


Figure 8 Storyboard 7

Storyboard 8

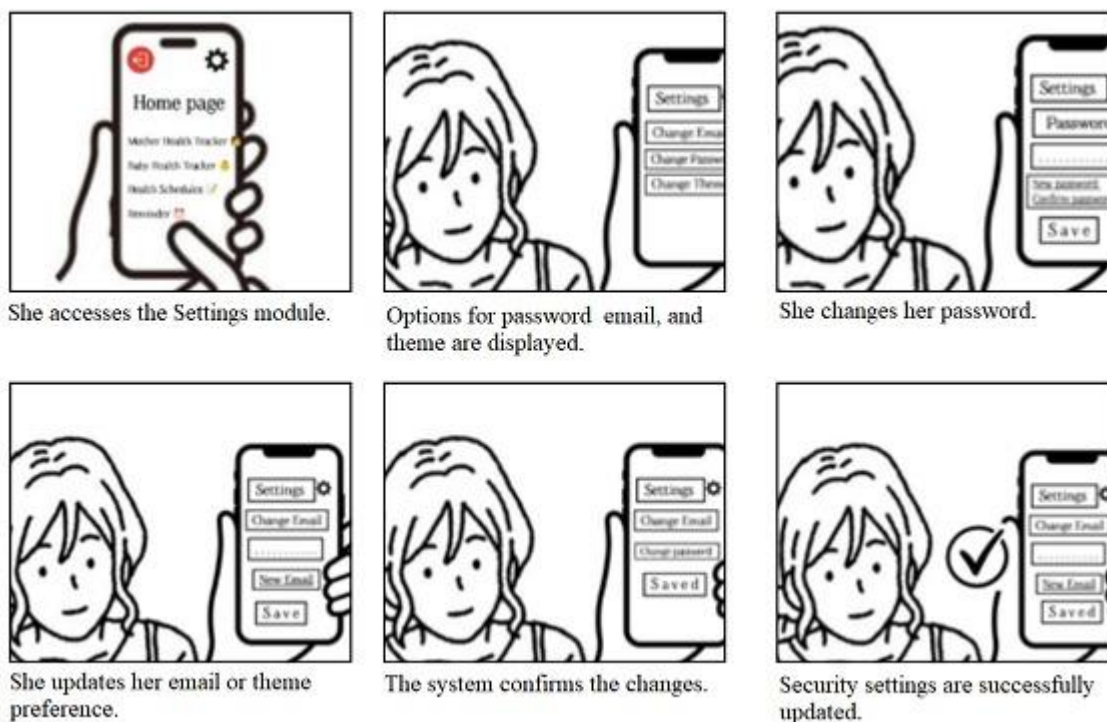


Figure 9 Storyboard 8

Storyboard 9

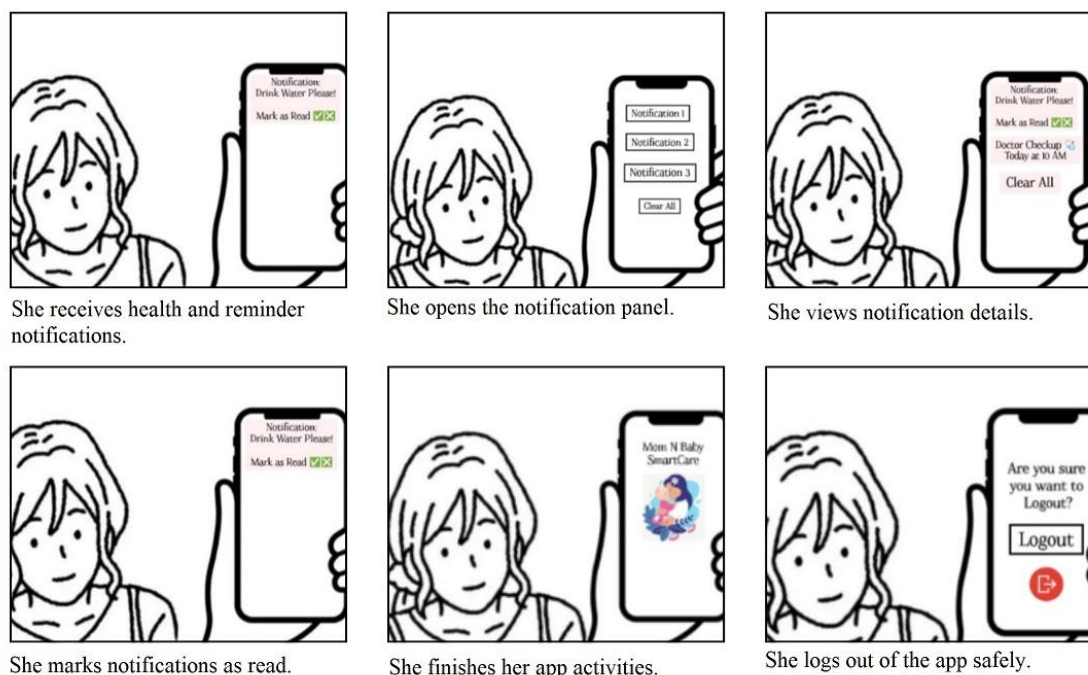


Figure 10 Storyboard 9

3.10 Summary:

This chapter describes the Software Requirements Specification (SRS) for the Mom N Baby SmartCare mobile application, designed to help mothers manage their own and their babies' health on a single platform. It outlined the system's main features, including user registration and secure login, profile management, mother and baby health tracking, reminders, notifications, medical records with graphical views, and settings management. The chapter also defined non-functional requirements such as usability, performance, reliability, security, and availability to ensure safe and smooth system operation. Use cases and storyboards were included to clearly demonstrate user interactions and system behavior, providing a strong foundation for developing a simple, organized, and reliable health management application.



Chapter No 4

Software Design Specification



4.1 System Design

Mom N Baby SmartCare is a mobile application designed to help mothers manage their own health and their baby's care through a single platform. The system allows secure user authentication, mandatory profile setup and access to a home dashboard. Core features such as health tracking, schedules, reminders, notifications and records with graphs are interconnected to ensure smooth data flow, timely alerts and reliable health monitoring.

Product Perspective

The product perspective explains the environment in which the **Mom N Baby SmartCare** application will operate and how different components of the system interact with each other.

| Perspective Type | Description |
|-------------------------|--|
| Platform | Mom N Baby SmartCare runs on Android mobile devices and is designed for mothers to manage their own health and their babies' health using an online application. |
| Database | The system uses Firebase as a cloud based database. Firebase stores user accounts, mother and baby profile, health tracking data, reminders, notifications, and medical records. |
| Architecture | The application follows a layered architecture. The UI layer manages user screens, the business logic layer processes health data and reminders, and the Firebase data layer handles real-time data storage and retrieval. |
| Authentication | User authentication is managed using Firebase Authentication with email verification and secure login. Only verified users can access system features. |
| Notifications | The system uses Firebase Cloud Messaging (FCM) to send health reminders and notifications to users in real time. |
| Features | Mothers can create and manage profile, track mother and baby health data, view records with graphs, set reminders, receive |



| | |
|-------------------------|---|
| | notifications and manage application settings. |
| Integration | The application integrates with Firebase services such as Authentication, Realtime Database/Firestore, and Cloud Messaging. No local storage or offline mode is supported. |
| Dependencies | The system is fully internet dependent. Continuous network connectivity is required for login, data access, synchronization, and notifications. Firebase services are essential for system operation. |
| User Interaction | The application provides screens for registration, login, home page, health tracking, records, reminders, notifications and settings. All user actions are performed online through the home page. |

Table 32 Product perspective

Design Constraints

Design constraints describe the limitations and conditions that influence system design and development.

| Constraint Type | Description |
|---------------------------|---|
| Time Constraint | The project must be completed within the academic timeline. Documentation and design are completed first, followed by development, testing, and implementation. |
| Cost Constraint | This is a student project with limited budget. Firebase free tier services and open source development tools are used to reduce cost. |
| Quality Constraint | The system must be secure, reliable, and easy to use. Firebase security rules and authenticated access ensure data protection and integrity. |
| Scope Constraint | The application focuses only on mother and baby health management. Hospital systems, doctor consultations, and offline features are not included. |



| | |
|----------------------------|--|
| Risk Constraint | Since the application is fully online, poor internet connectivity may affect system usability. Data security and service availability risks are minimized through Firebase-managed services and testing. |
| Resource Constraint | The project is developed by students using limited resources, basic hardware, and standard development tools. |
| Benefit Constraint | The system reduces manual record keeping and provides real time access to health data. Firebase enables scalability, secure storage, and easier maintenance. |

Table 33 Design Constraints

4.2 Design Considerations

1. Assumptions and Dependencies

- The application is designed to run on Android smartphones.
- Users are expected to have a stable internet connection.
- Email verification is required to access the app features.
- The system uses Firebase for authentication, data storage, and notifications.
- Proper app functionality depends on internet availability and Firebase services.

2. Limitations

- The application does not support offline usage.
- Performance may decrease with slow or unstable internet.
- The app is intended only for personal health tracking.
- It does not provide medical advice or professional consultation.
- The system is compatible only with Android devices.
- Some features may depend on device performance and Firebase availability.

3. Risks

- The application may temporarily crash or slow down on some devices due to hardware or compatibility issues; recovery is expected within 4–5 hours.
- Data loss may occur if a device is damaged before successful synchronization with the server.
- Duplicate or outdated data may appear during synchronization when updates are made from multiple sources.
- Sync failures can happen if the internet connection is interrupted during data transfer.
- These risks are reduced through data validation, conflict detection, and automatic backup mechanisms, ensuring system reliability.

4.3 Requirements Traceability Matrix

| Requirement ID | Scope | Requirement Description | Design Specification |
|----------------|--------------------|--|-------------------------|
| FR-1 | User Registration | The system shall allow the mother to register an account using email and password, with input validation and email verification. | Firebase Authentication |
| FR-2 | Email Verification | The system shall verify the user's email before activating the account. | Firebase Authentication |
| FR-3 | User Login | The system shall allow the mother to | Firebase Authentication |



| | | | |
|------|-----------------------|---|--------------------------|
| | | log in securely using a verified email and password. | |
| FR-4 | Forgot Password | The system shall allow the mother to reset her password via email verification. | Firestore Authentication |
| FR-5 | Mom & Baby Profile | The system shall allow the mother to add, view, edit, and delete her profile and her baby's profile in one place. | Firestore Database |
| FR-6 | Mother Health Tracker | The system shall allow the mother to add, view, update, and delete her health data. | Firestore Database |
| FR-7 | Baby Health Tracker | The system shall allow the mother to add, view, update, and delete baby health data. | Firestore Database |
| FR-8 | Reminder Management | The system shall allow the mother to add, edit, view, and delete reminders. | Firestore Database |
| FR-9 | Records & Graphs | The system shall | MPAndroidChart Library |



| | | | |
|-------|---------------------|---|---|
| | | display records and generate visual graphs for mother and baby health data. | |
| FR-10 | Health Schedule | The system shall allow the mother to manage health schedules for mother and baby care routines. | Firebase Database |
| FR-11 | Notifications | The system shall send notifications for selected health schedules and reminders. | Firebase Cloud Messaging |
| FR-12 | Settings Management | The system shall allow the mother to update email, password, and app theme securely, with email verification for changes. | Firebase Authentication and Firebase Database |
| FR-13 | Logout | The system shall allow the mother to securely log out and terminate the active session. | Firebase Authentication |

Table 34 Requirements Traceability Matrix

4.4 Design Models

Design models are diagram that shows the system. It explains how different parts work together. It is easy to understand. In object-oriented development, a design model usually includes a class diagram. It helps us plan the system properly, reduce errors, and ensure that all features work together smoothly.

1. Design Class Diagram (DCD)

The class diagram shows how the Mom N Baby SmartCare system is structured. It explains the main classes in the app, what data they store, and what actions they perform. This diagram helps in understanding how different parts of the system are connected and how the application works internally.

Mother (User): This class represents the main and only user of the system and controls access to all application features.

Attributes: username, email, password, and isLoggedIn.

Methods: register(), login(), forgotPassword(), logout().

Profile: This class manages mandatory personal and baby information required to use application features.

Attributes: motherName, motherAge, babyName, babyDOB.

Methods: view(), edit().

Setting: This class manages account security and application customization.

Attributes: theme, email, password.

Methods: changePassword(), changeEmail(), changeTheme().

Reminder: This class manages reminder and alarm functionality for the user.

Attributes: id, title, date, time.

Methods: add(), edit(), view(), delete().

MotherHealthTracker: This class manages health records related to the mother.

Attributes: recordId, glucoseLevel, bloodPressure, weight, digestionInfo, date.

Methods: addRecord(), updateRecord(), deleteRecord(), viewRecord().



BabyHealthTracker: This class manages health and development records related to the baby.

Attributes: weight, milestone, allergyInfo, medicalRecord, date.

Methods: addRecord(), updateRecord(), deleteRecord(), viewRecord().

RecordsAndGraph: This class provides a common interface to view and manage records and graphical reports for both mother and baby.

Attributes: recordId, recordType, recordName.

Methods: updateRecord(), deleteRecord(), viewRecord().

HealthSchedule: This class manages health schedules selected by the user.

Attributes: id, name, type, isSelected.

Methods: view(), select(), deselect().

Notifications: This class manages system-generated notifications and user responses.

Attributes: id, message, status.

Methods: viewNotification(), markAsRead().

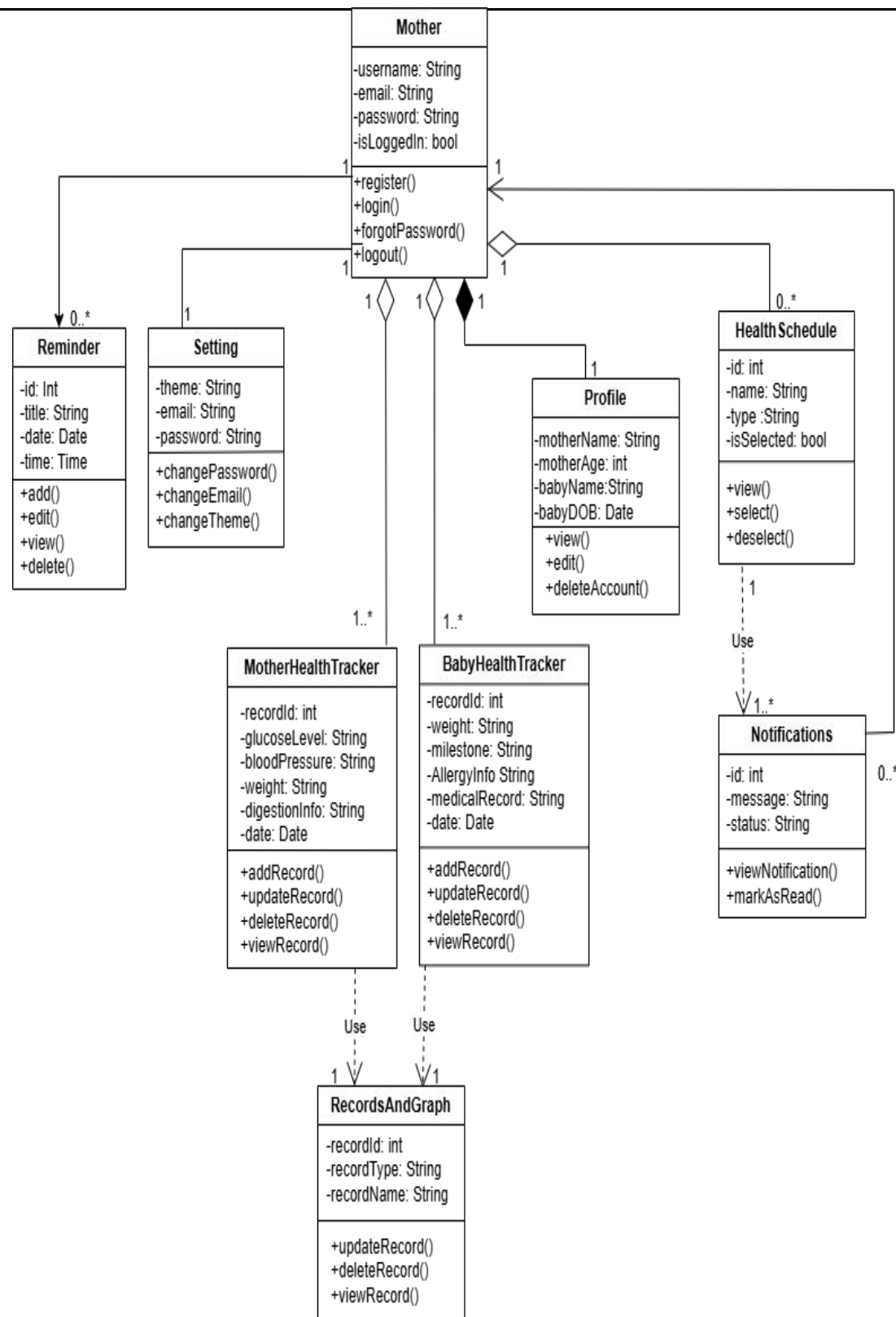


Figure 11 Class Diagram

2. Interaction Diagram (Either sequence or collaboration)

Sequence Diagram

1. Register

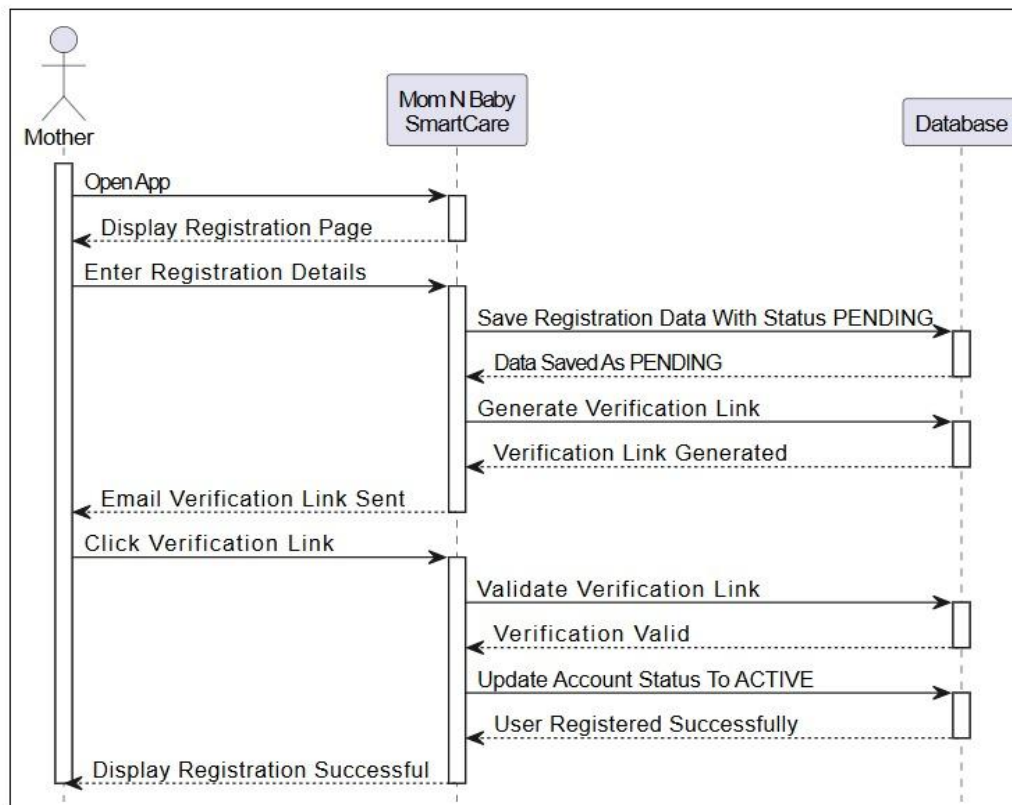


Figure 12 Register Sequence Diagram

2. Login

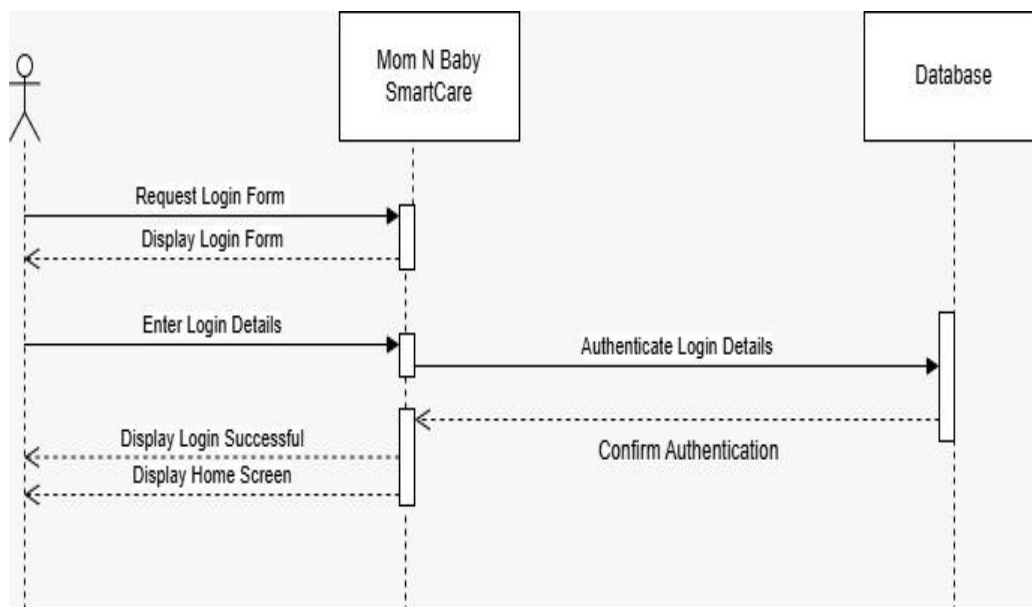


Figure 13 Login Sequence Diagram

3. Forgot Password

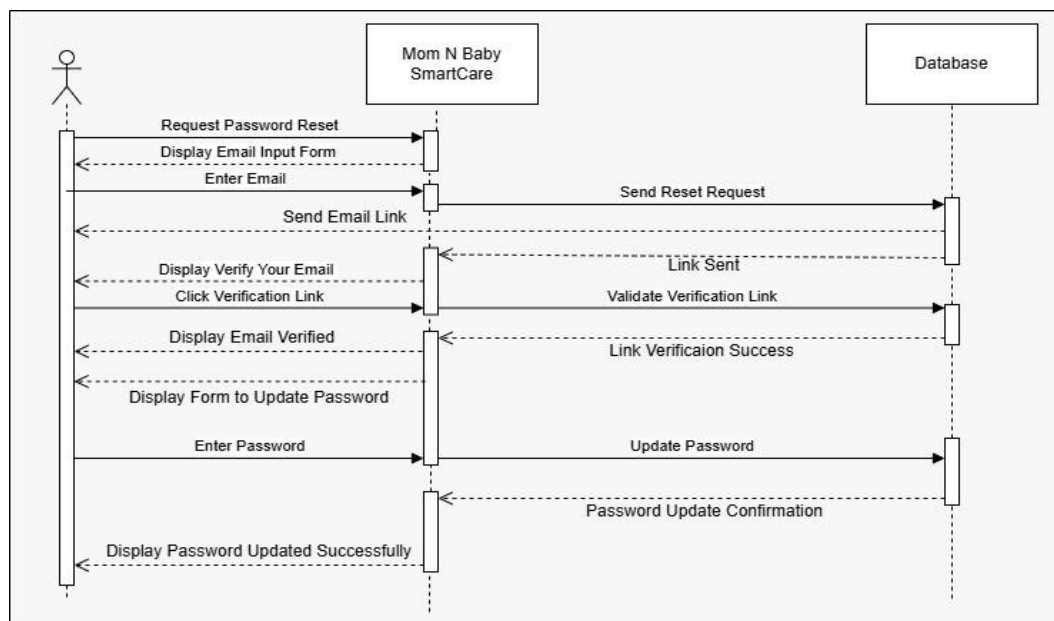


Figure 14 Forgot Password Sequence Diagram

4. Profile

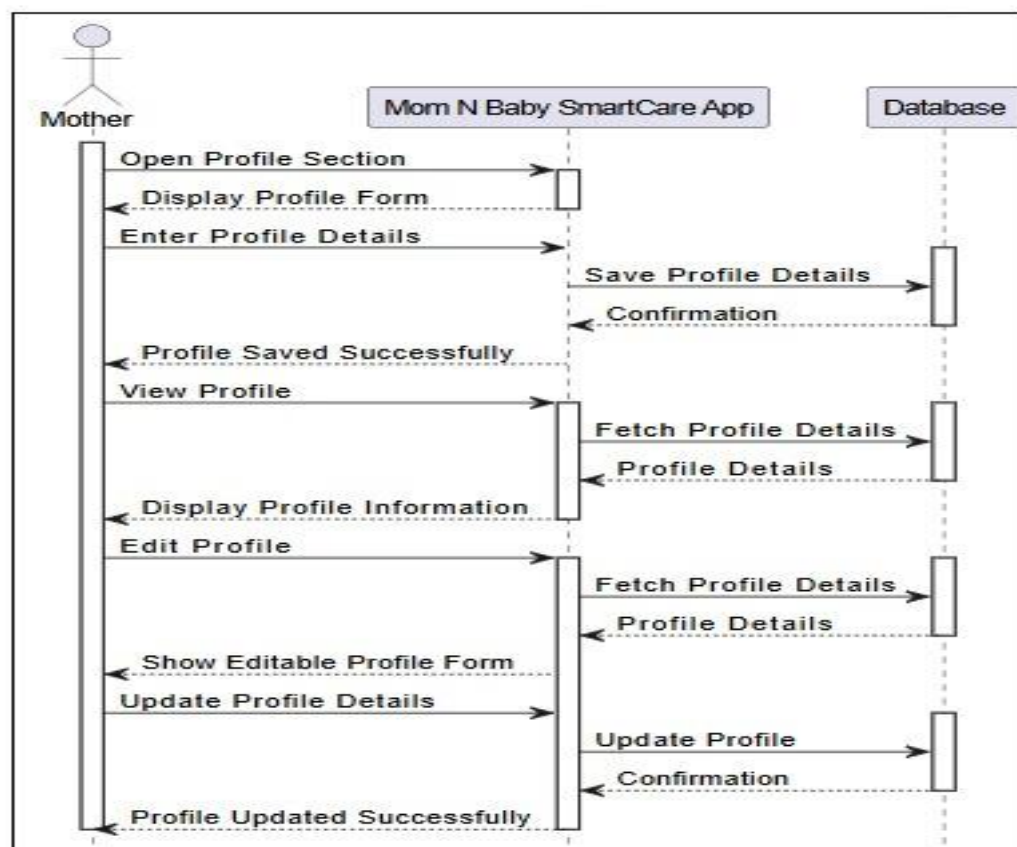


Figure 15 Profile Sequence Diagram

5. Health Schedule

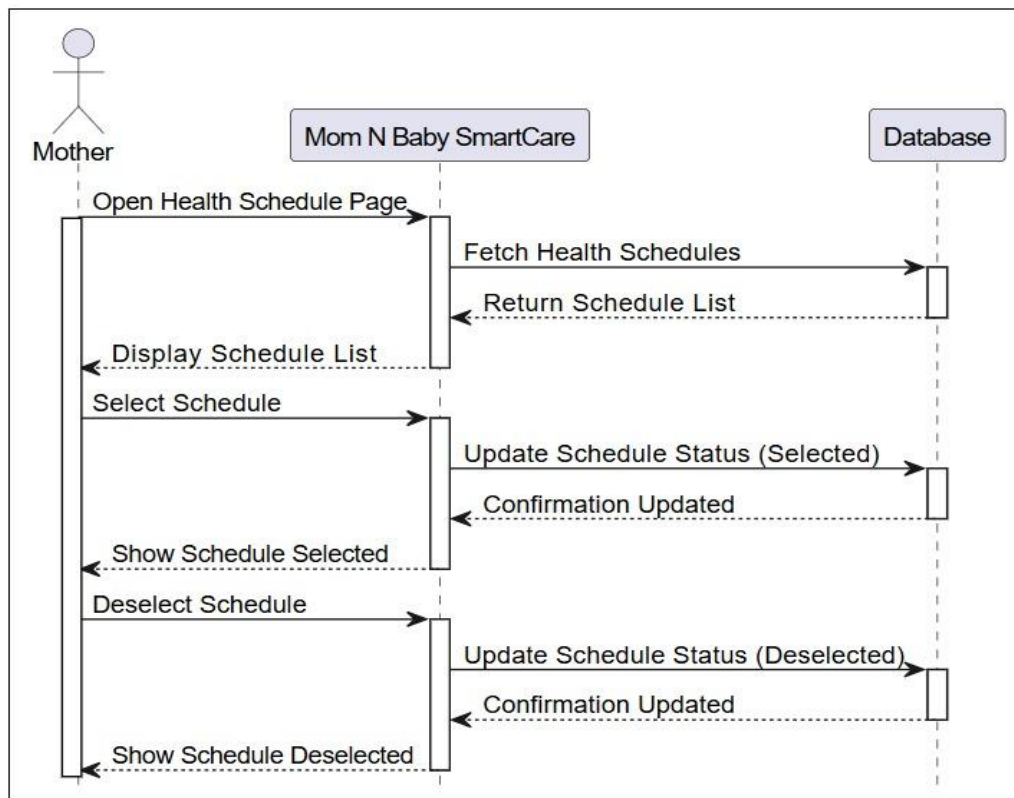


Figure 16 Health Schedule Sequence Diagram

6. Notifications

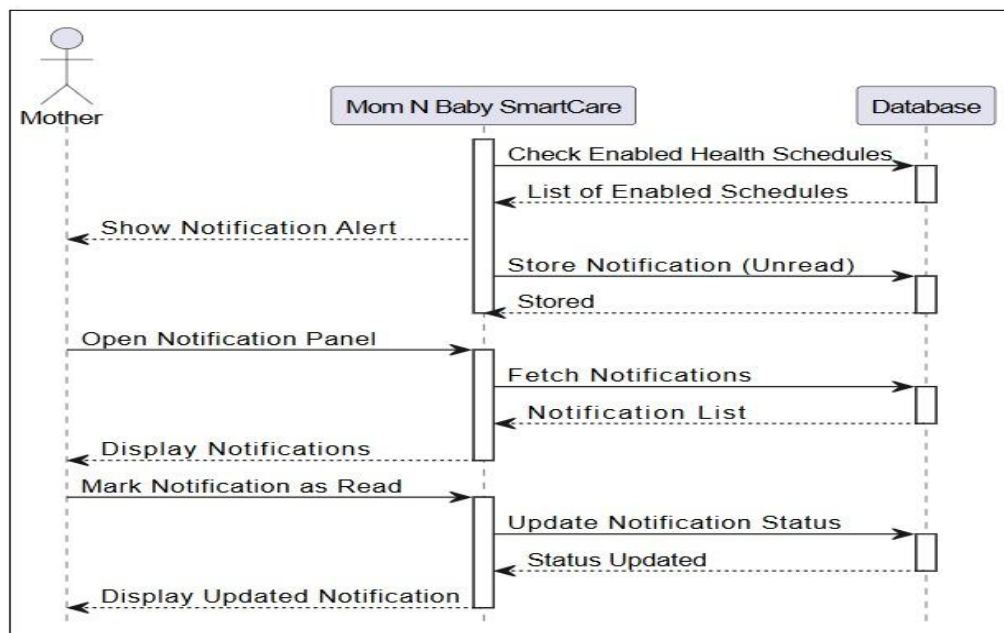


Figure 17 Notifications Sequence Diagram

7. Settings

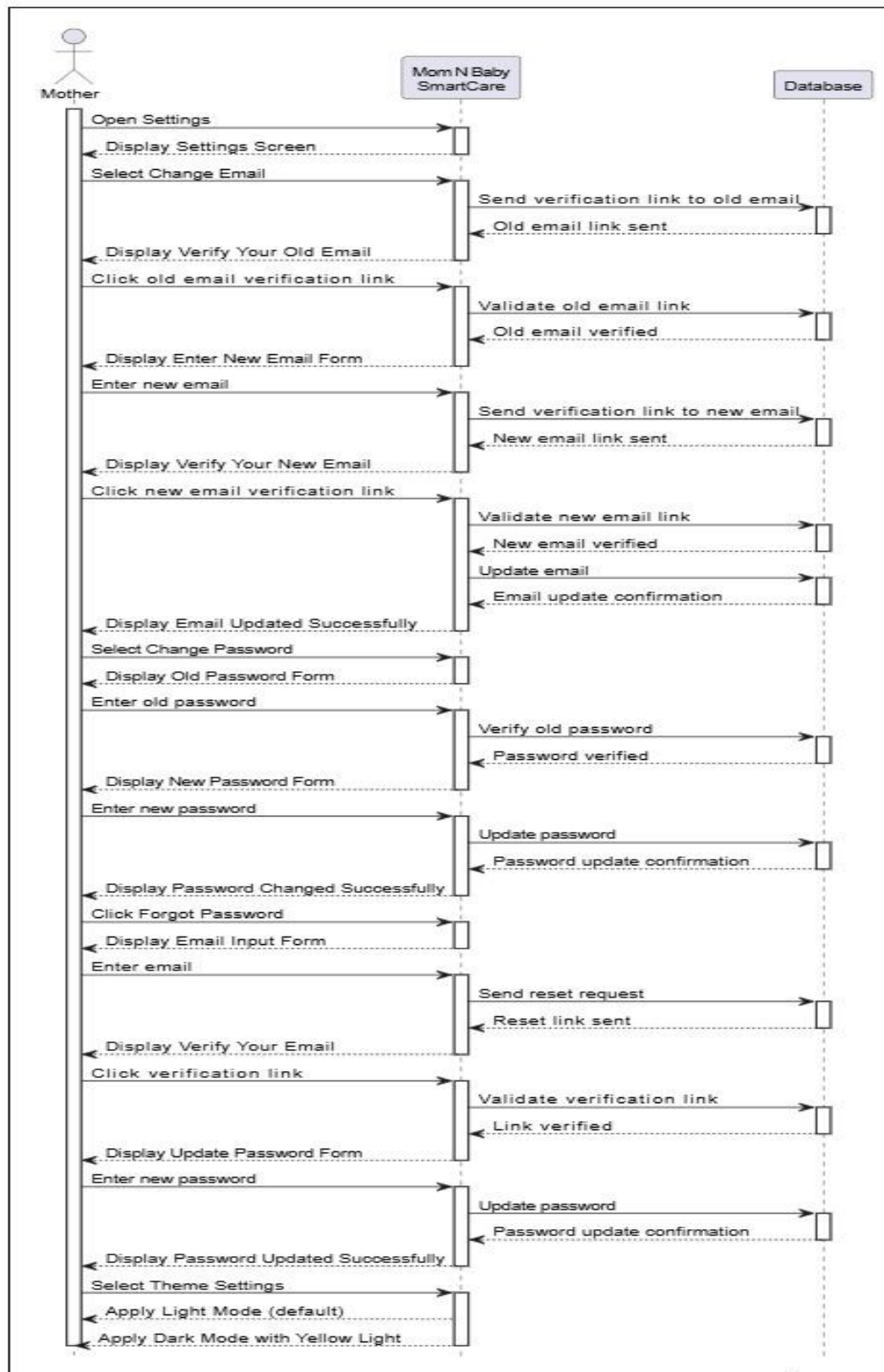


Figure 18 Settings Sequence Diagram

8. Access and add data in Mother Health Tracker

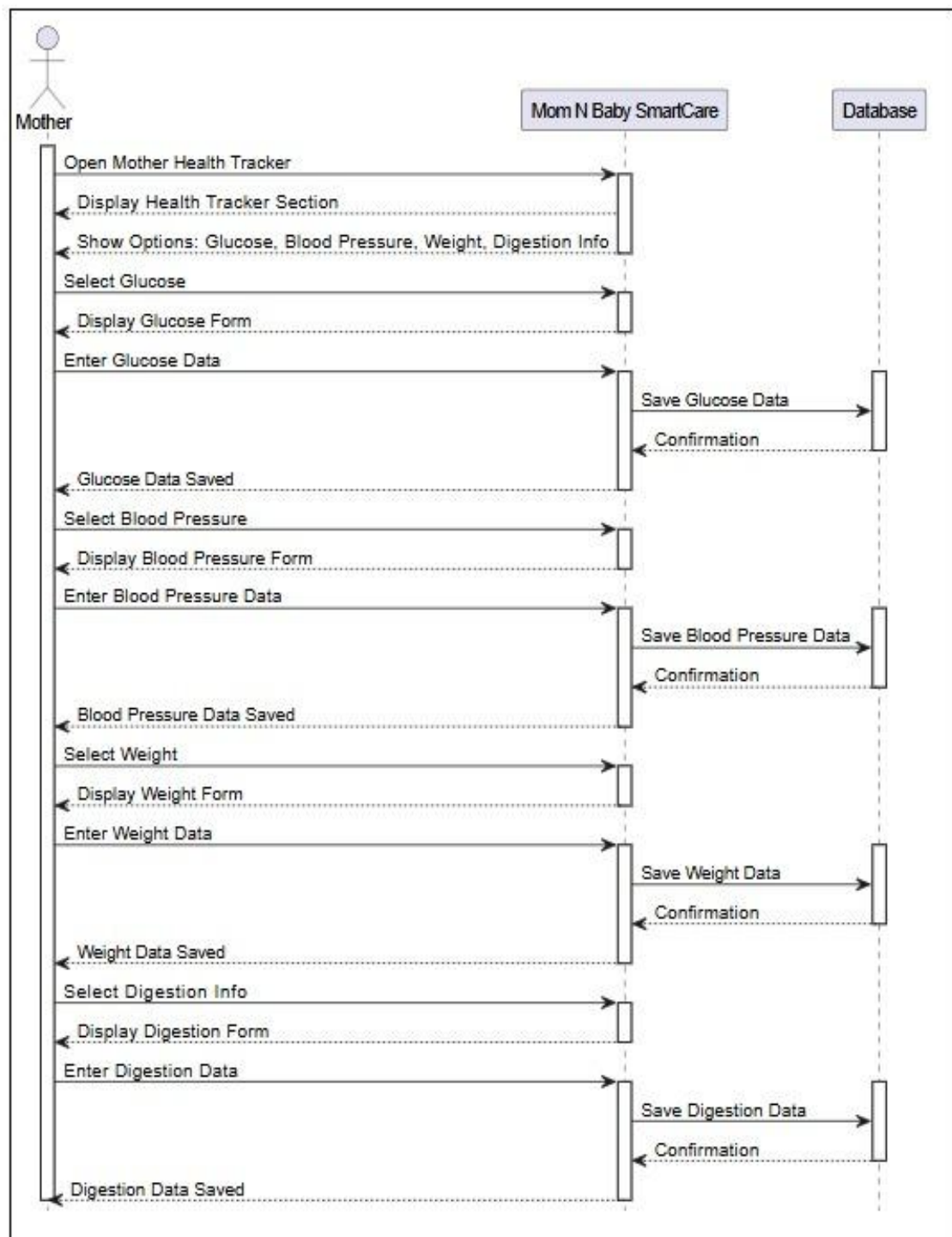


Figure 19 Access and add data in Mother Health Tracker Sequence Diagram

9. Update Mother Health Tracker

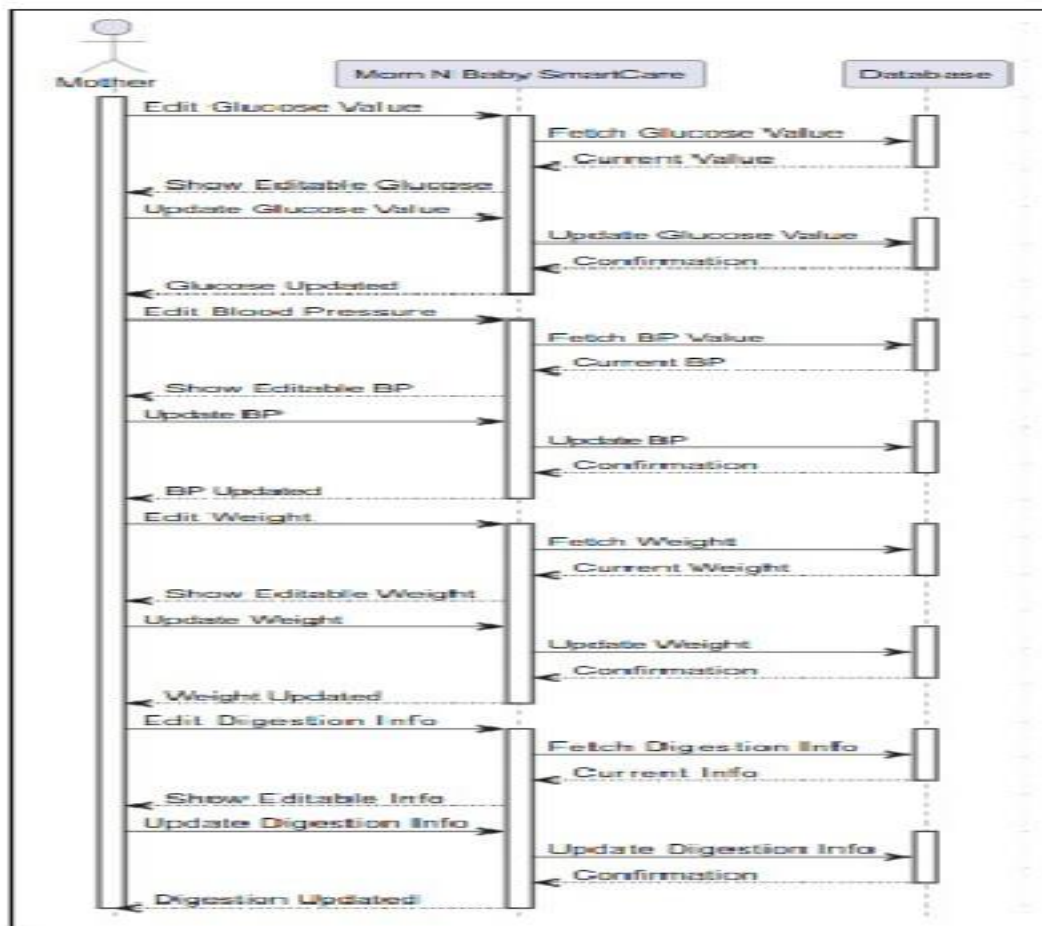


Figure 20 Update Mother Health Tracker Sequence Diagram

10. View Mother Health Tracker

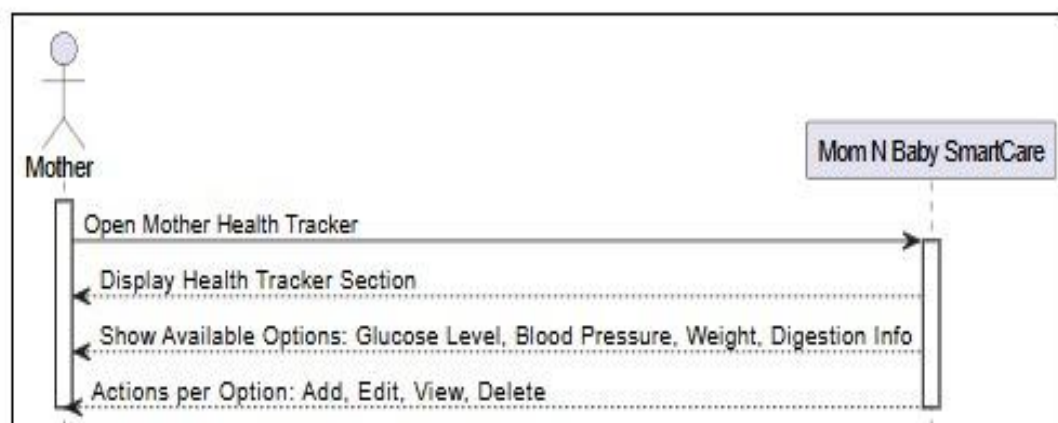


Figure 20 View Mother Health Tracker

11. Delete Data in Mother Health Tracker

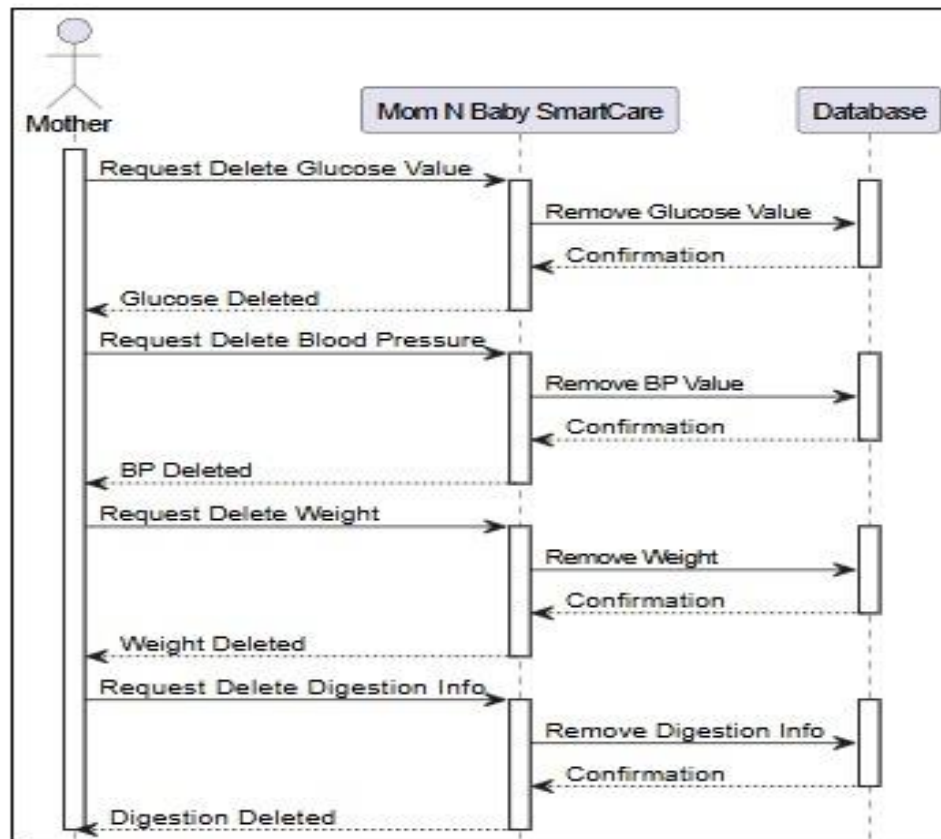


Figure 21 Delete Data in Mother Health Tracker Sequence Diagram

12. View Baby Health Tracker

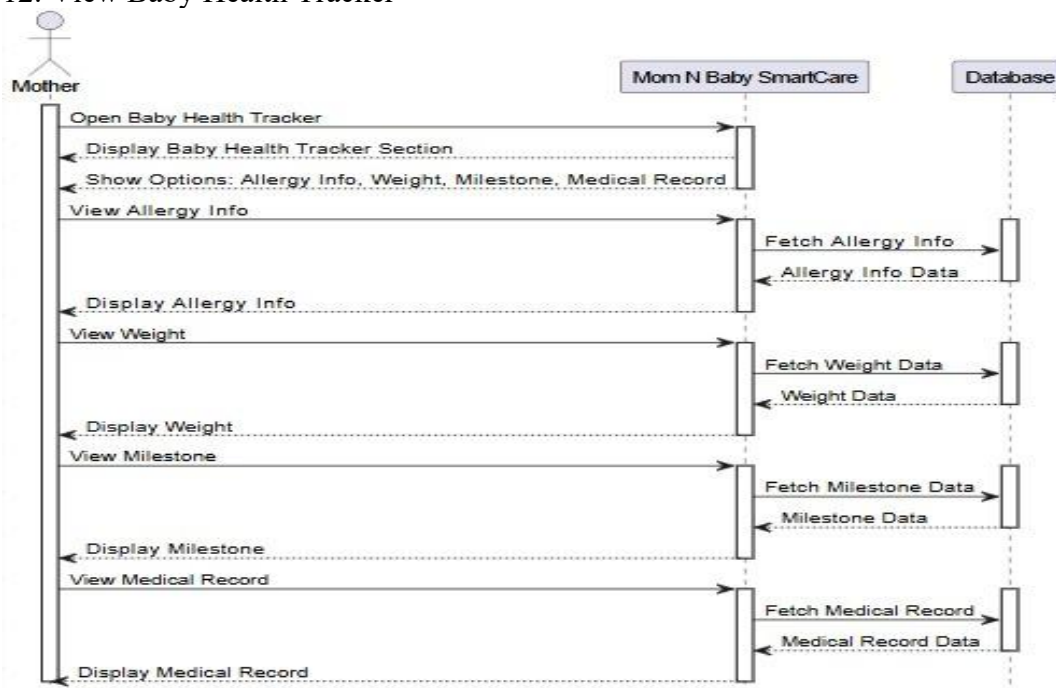


Figure 22 View Baby Health Tracker Sequence Diagram

13. Add data in Baby Health Tracker

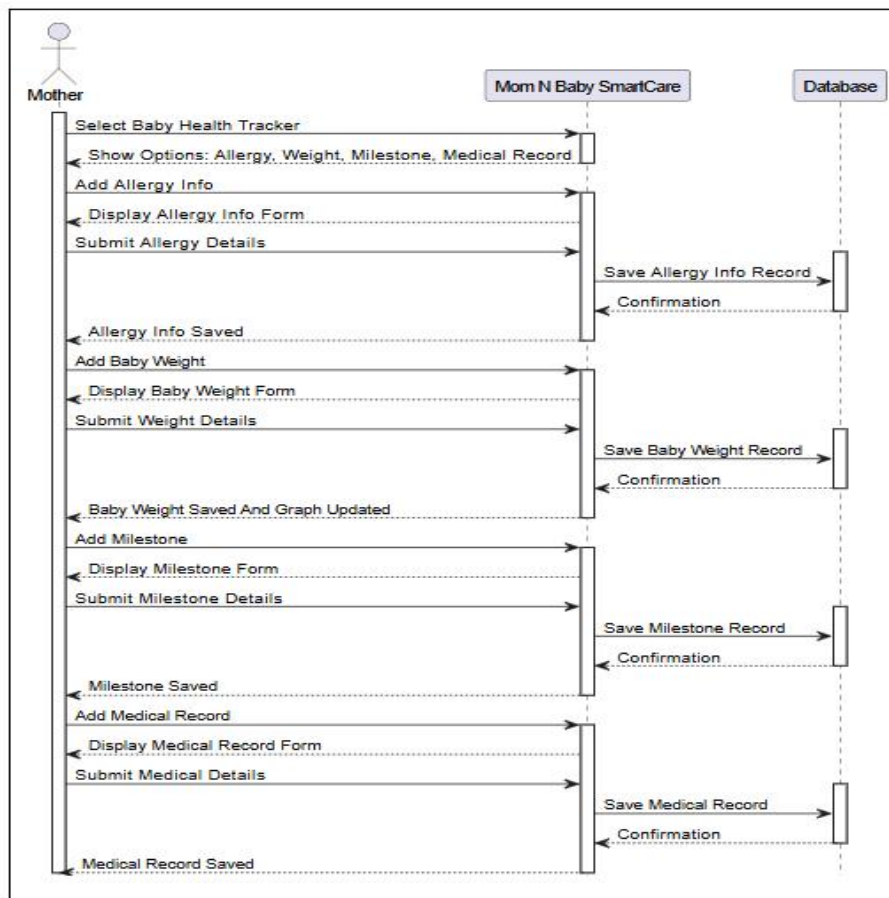


Figure 23 Add data in Baby Health Tracker Sequence Diagram

14. Update Baby Health Tracker

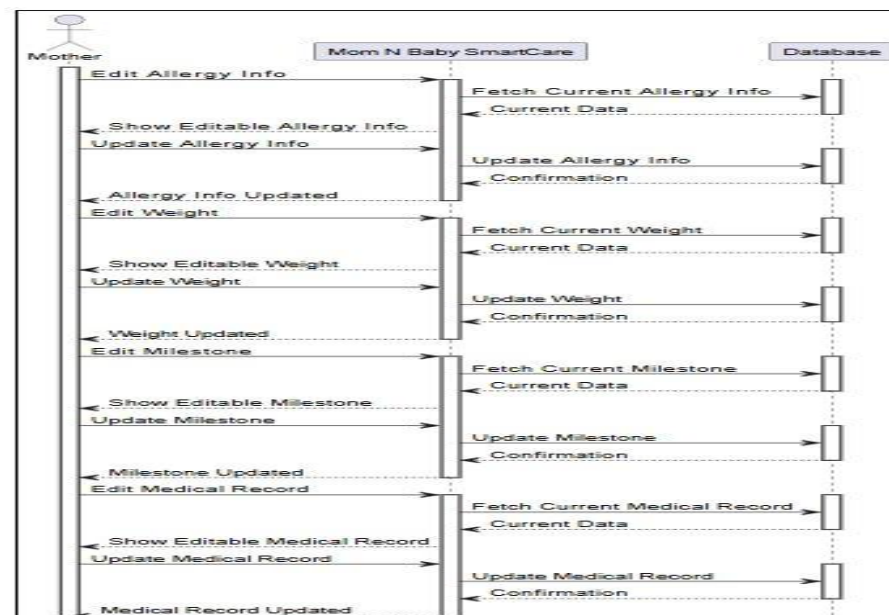


Figure 24 Update Baby Health Tracker Sequence Tracker

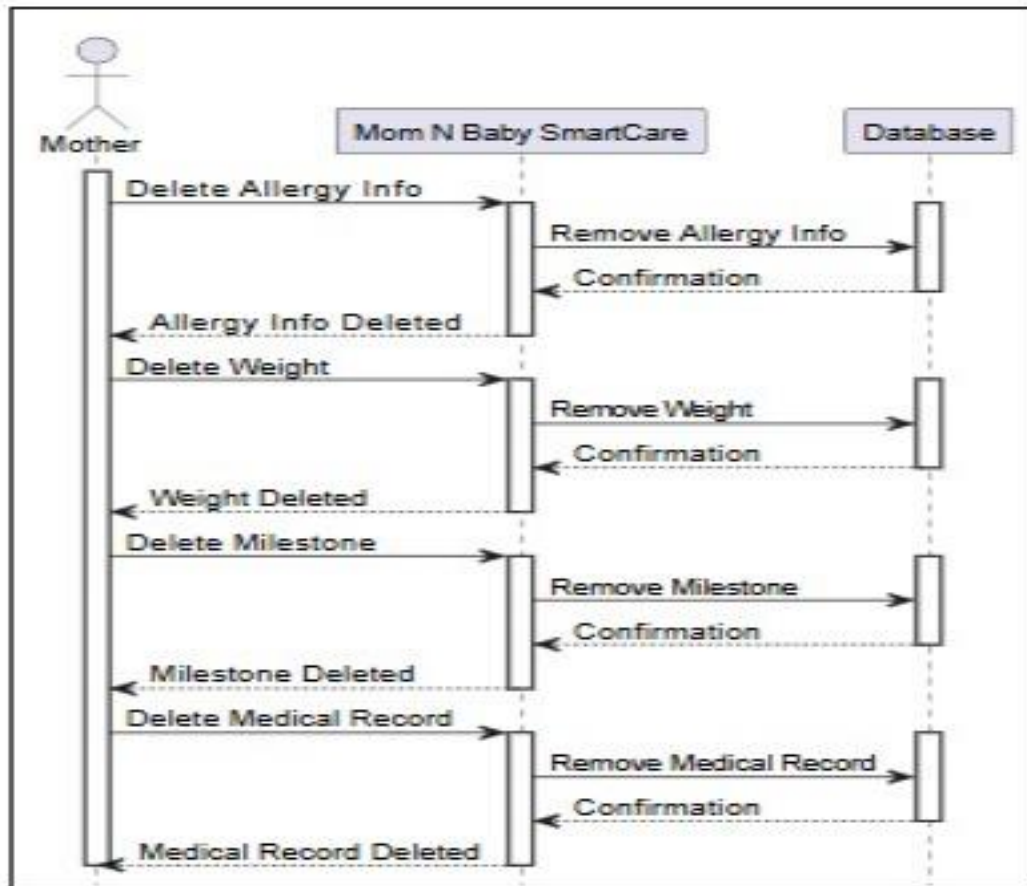
15. Data Deletion in Baby Health Tracker

Figure 25 Data Deletion in Baby Health Tracker Sequence Diagram

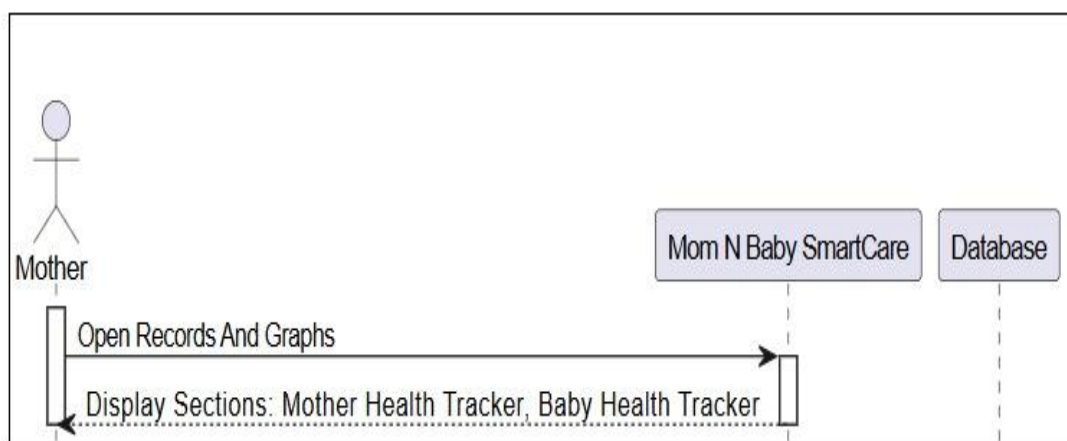
16. Access Records and Graphs

Figure 26. Access Records and Graphs Sequence Diagram

17. View Mother Health Records and Graphs

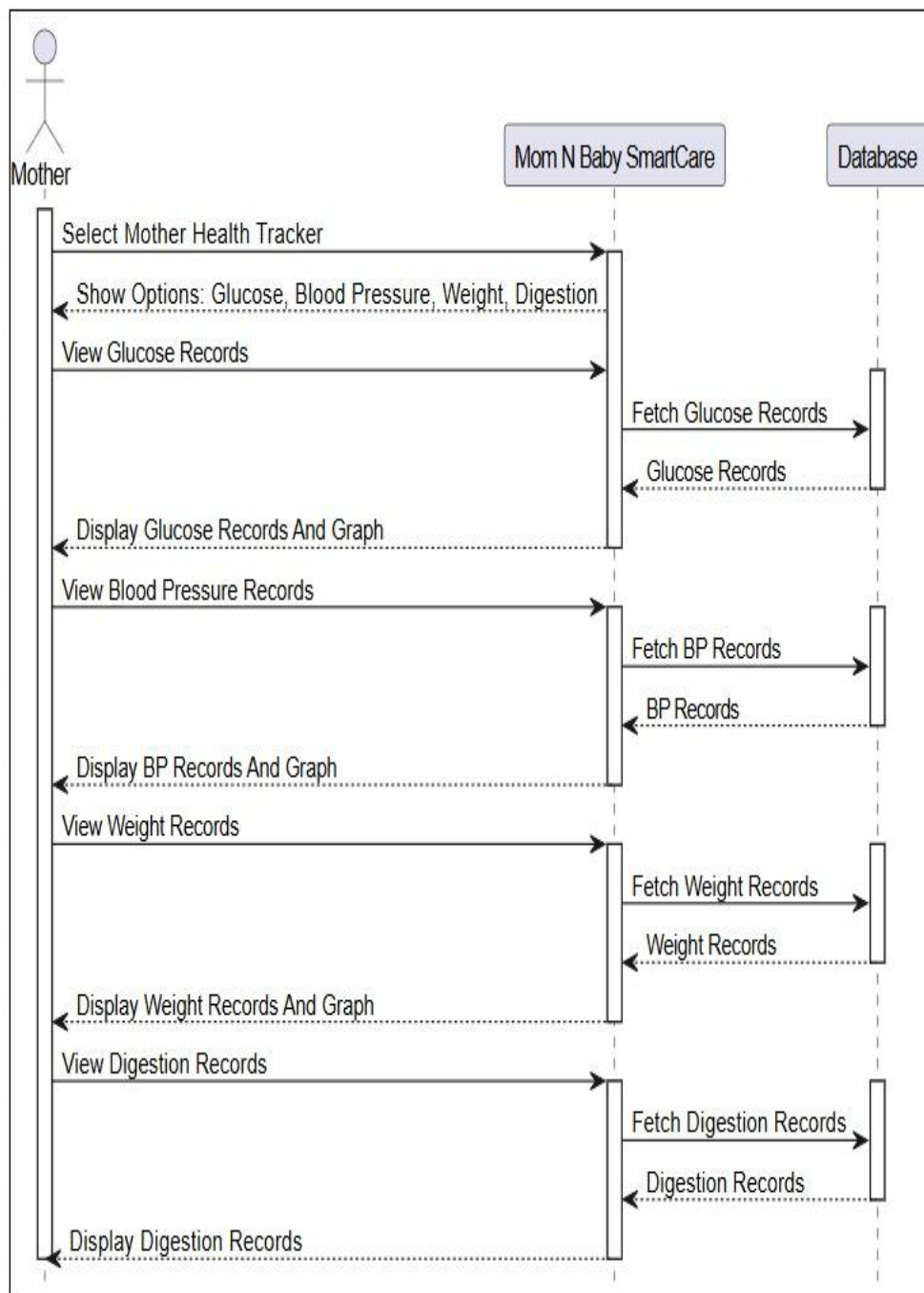


Figure 27 View Mother Health Records and Graphs Sequence Diagram

18. View Baby Health Records and Graphs

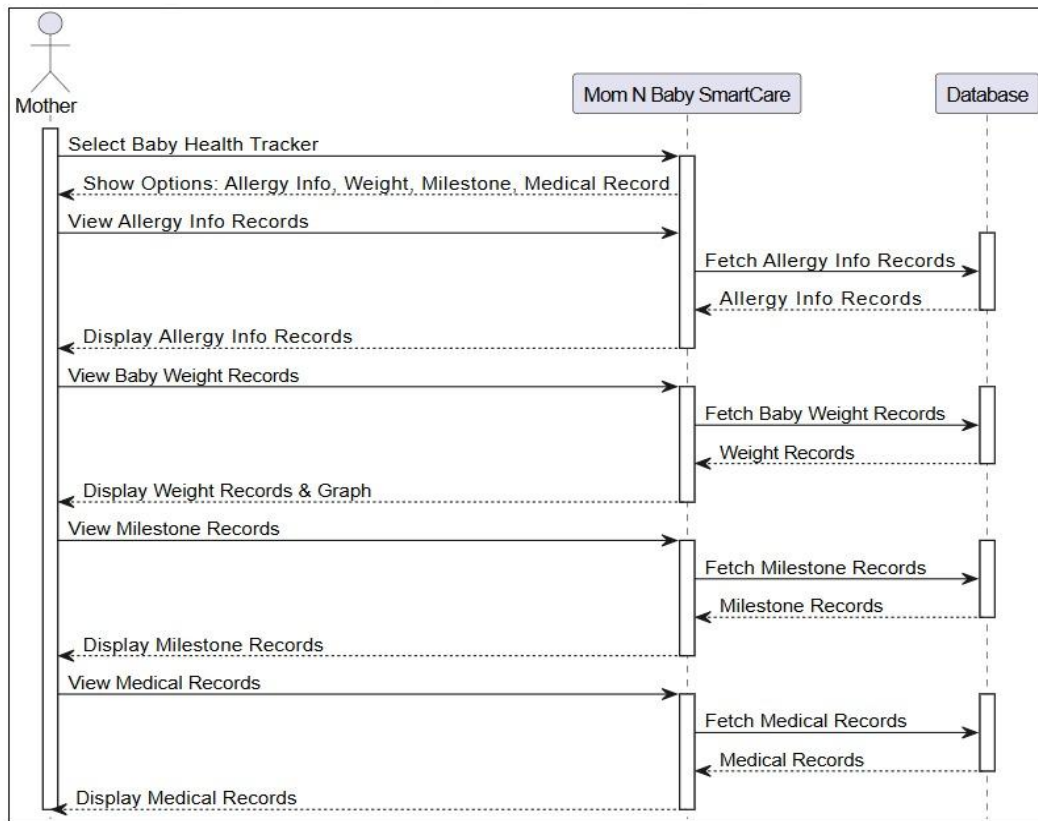


Figure 28 View Baby Health Records and Graphs Sequence Diagram

19. Edit Mother Health Records and Graphs

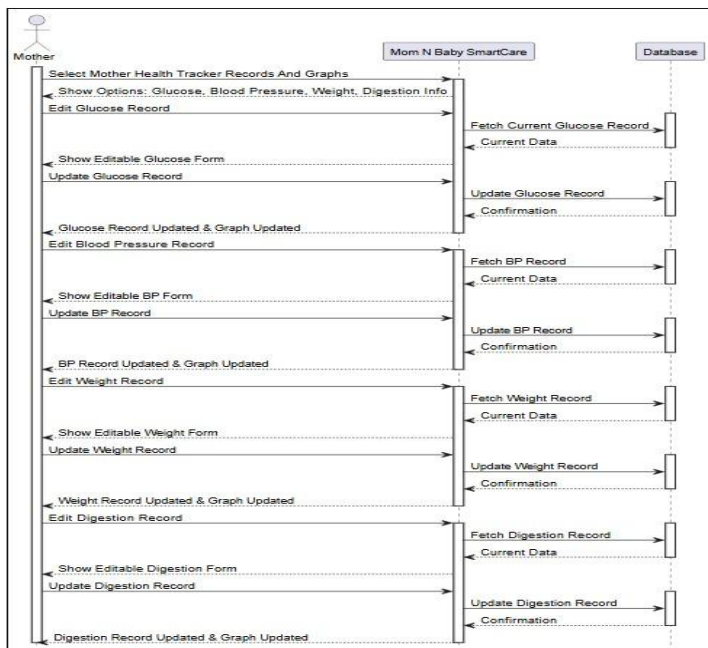


Figure 29 Edit Mother Health Records and Graphs Sequence Diagram

20. Edit Baby Health Records and Graph



Figure 30 Edit Baby Health Records and Graph Sequence Diagram

21. Delete Mother Health Records

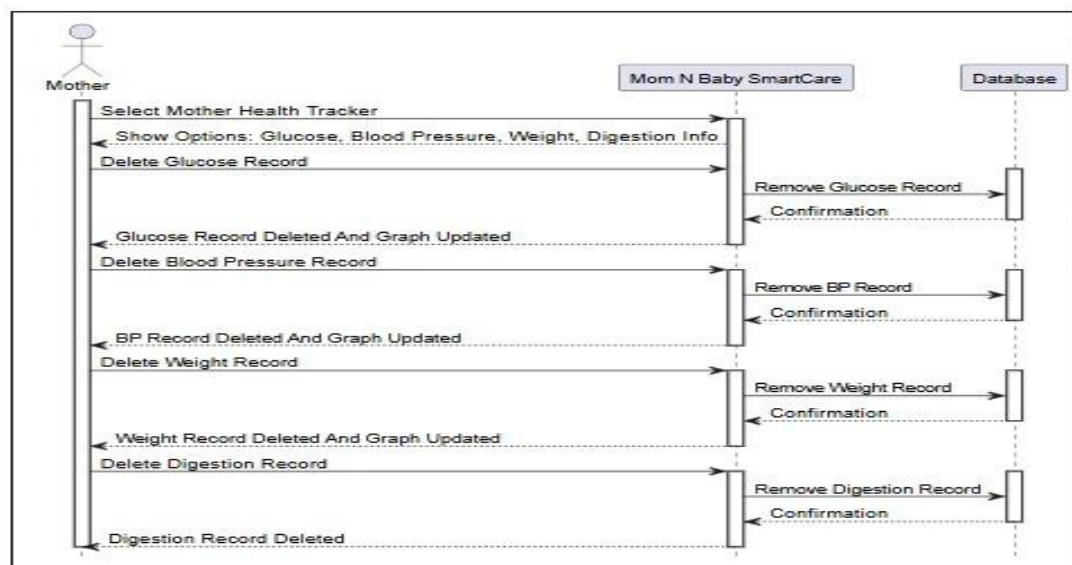


Figure 31 Delete Mother Health Records Sequence Diagram

22. Delete Baby Health Records



Figure 32 Delete Baby Health Records Sequence Diagram

23. Reminder

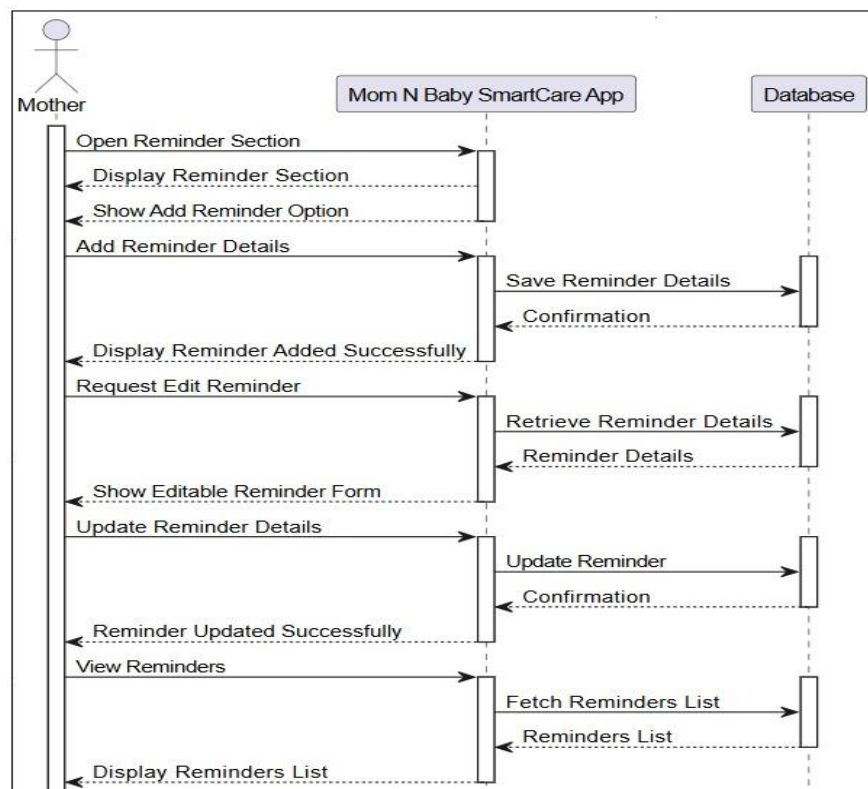


Figure 33 Reminder Sequence Diagram

24. Logout

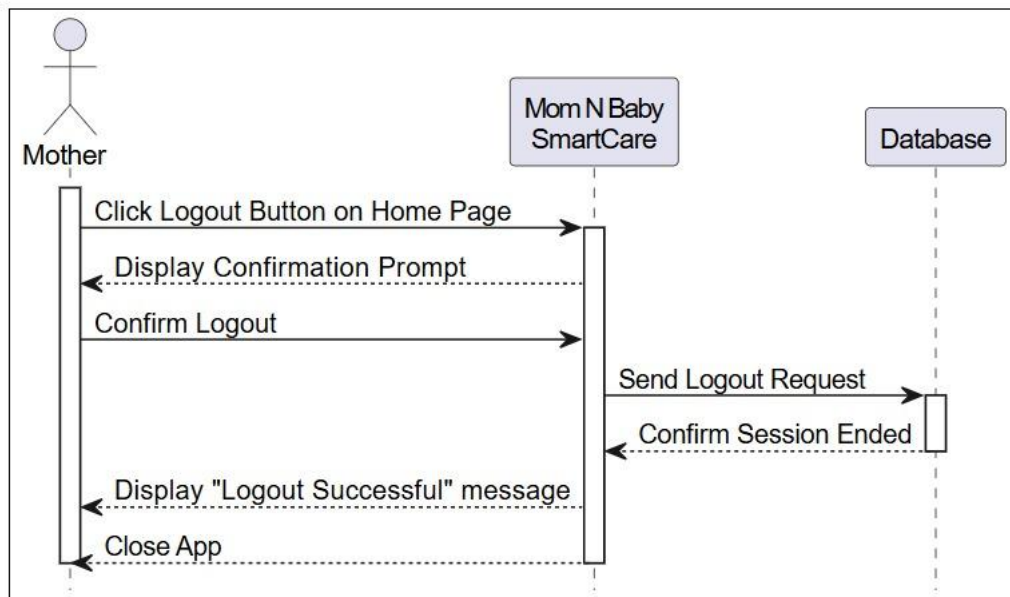


Figure 34 Logout Sequence Diagram

25. Delete Account

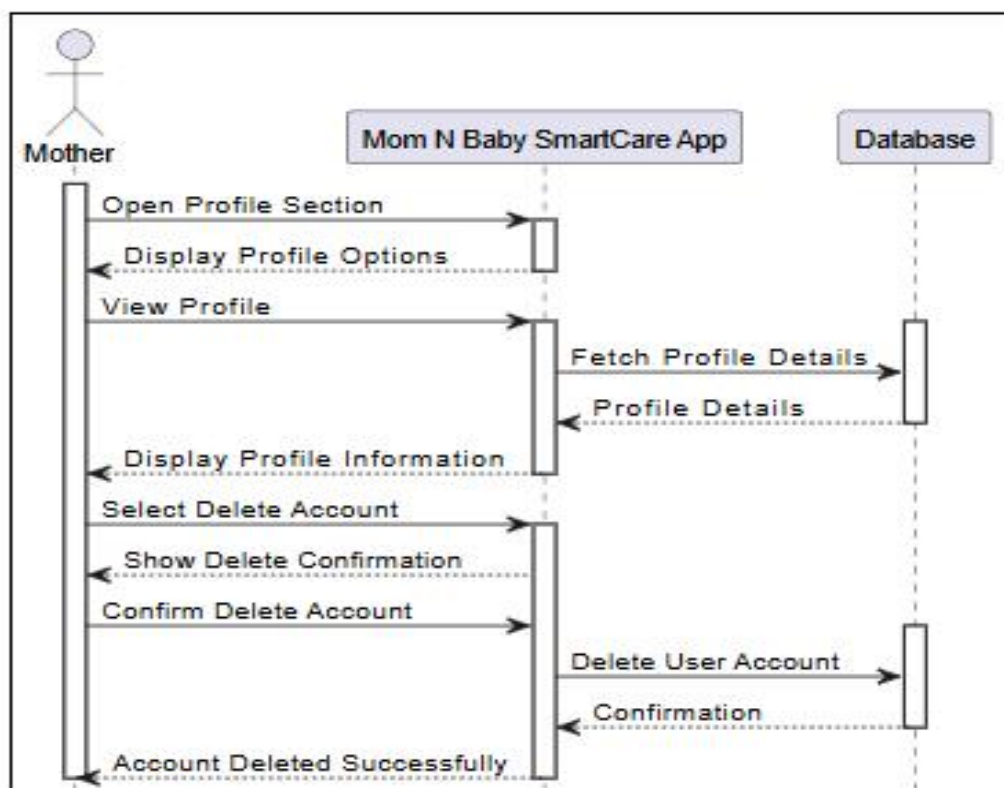


Figure 35 Delete Account Sequence Diagram

3. State Transition Diagram

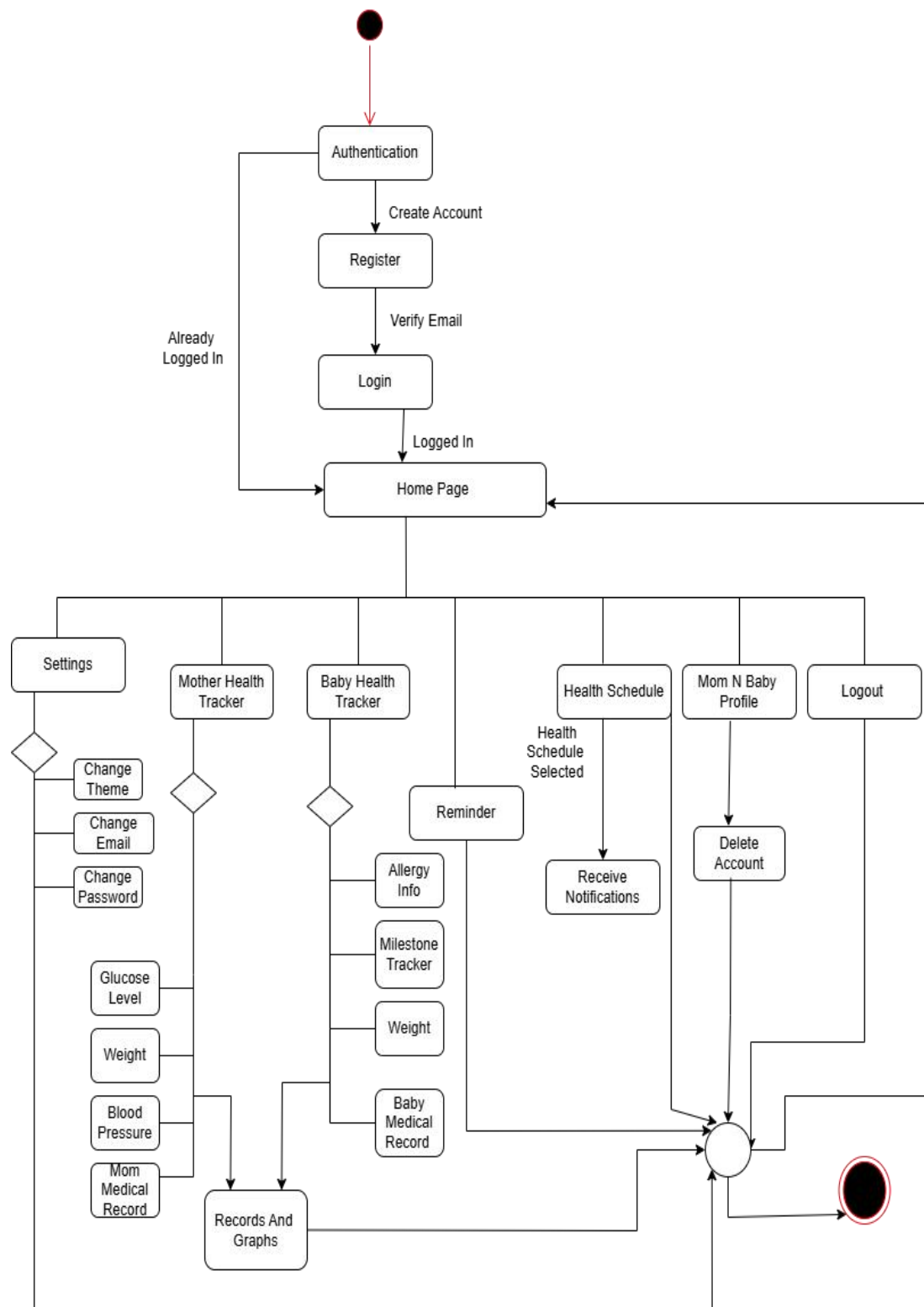


Figure 36 Mom N Baby SmartCare State Transition Diagram

4.5 Architectural Design

Our Mom N Baby SmartCare system follows Component Based, Layered and MVC architecture.

- **Component-Based Architecture** divides the system into modules like Authentication, Mother Baby Profile, Health Tracker, Reminder, Notification, Records & Graphs, and Settings, making it easy to maintain.
- **Layered Architecture** separates the system into layers:
- **UI Layer** shows screens.
- **Logic Layer** handles operations.
- **Data Layer** stores all information in **Firestore**.
- **MVC Architecture** separates concerns:
- **Model** manages data.
- **View** displays UI and graphs (**MPAndroidChart**).
- **Controller** connects user actions with system logic.

This design makes the system **flexible, robust, and easy to maintain**, supporting all functional requirements.

System Architecture Components

Frontend Layer

- Login / Register component
- Home Page UI component
- Mom & Baby Profile UI component
- Mother Health Tracker UI component
- Baby Health Tracker UI component
- Reminder UI component
- Health Schedule UI component
- Records & Graph UI component
- Notifications UI component
- Settings UI component
- Logout component

Backend Layer

- Authentication controller
- Registration controller
- Email Verification controller
- Profile Management controller
- Mother Health Tracker controller



Mom N Baby SmartCare

- Baby Health Tracker controller
- Reminder controller
- Health Schedule controller
- Records & Graph controller
- Notification controller
- Settings controller
- Logout controller

Data Layer

- User Model
- Profile Model
- Mother Health Tracker Model
- Baby Health Tracker Model
- Reminder Model
- Health Schedule Model
- Records & Graph Model
- Notification Model
- Settings Model
- Session Model

External Services

- Firebase Authentication
- Firebase Realtime Database / Cloud Firestore
- Firebase Cloud Messaging
- Email Verification Service
- MP Android Chart Library

Database

- Cloud Database (Firebase Realtime Database / Firestore)

UML Component Diagram

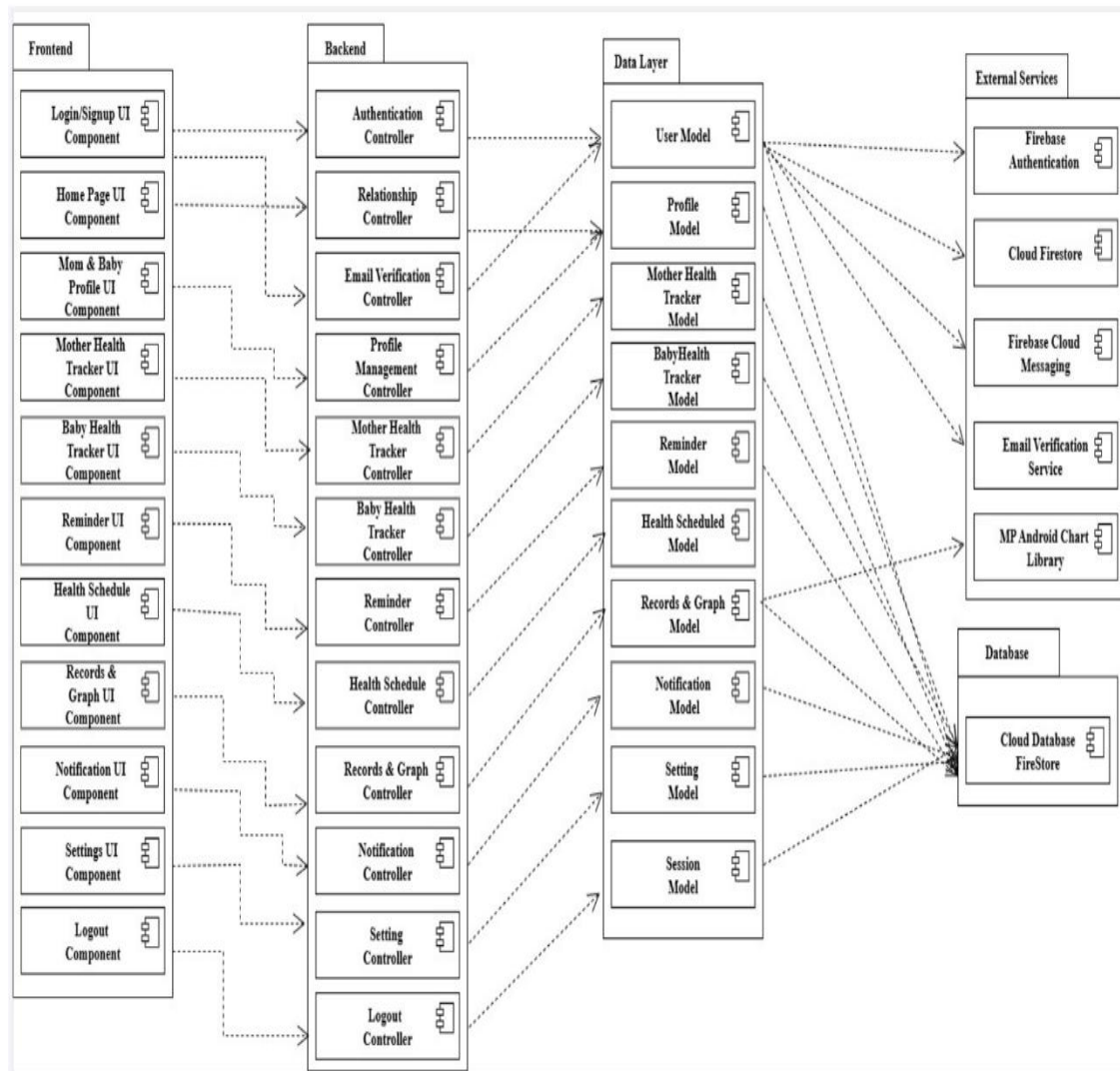


Figure 37 UML Component Diagram

4.6 Data Design

ER Diagram

The **Entity-Relationship Diagram (ERD)** of Mom N Baby SmartCare shows the entities and their relationships. Entities represent real-world objects within the system, each with its attributes and relationships with other entities.

Entities and Attributes:

User: userID, motherName, motherAge, email, password

Baby: babyName, babyDOB, userID



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Mother Health Tracker: recordID, bloodPressure, weight, glucoseLevel, medicalRecords, userID

Baby Health Tracker: recordID, weight, allergies, milestones, medicalRecords, userID

Reminder: reminderID, title, dateTime, userID

Health Schedule: scheduleID, type, nextDueDate, userID

Notification: notificationID, title, message, dateTime, userID

Entities Relationships:

One-to-one: Each mother has one combined profile including her own and her baby's information.

One-to-many: One mother can create many reminders, many health schedule entries, and many notifications.

Many-to-many: Not applicable in current system; data is **user-specific** and linked by userID.

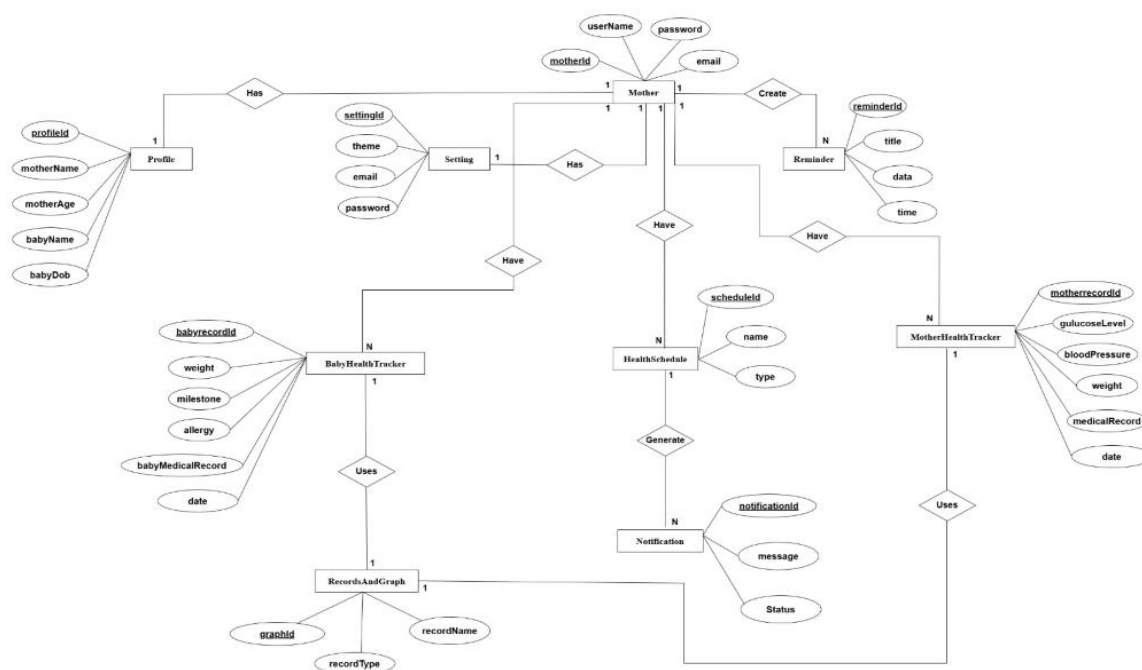


Figure 38 E-R Diagram

| Category | Component | Purpose | Storage |
|--------------------|--------------------|---|-------------------------------------|
| User Management | User Registration | Allow new users to create an account with name, email, and password | Firebase Firestore / Authentication |
| User Management | Email Verification | Verify user email via link to ensure account authenticity | Firebase Authentication |
| User Management | User Login | Authenticate existing users and manage login sessions | Firebase Authentication |
| User Management | Forgot Password | Allow users to reset password securely via email | Firebase Authentication |
| Profile Management | Mom & Baby Profile | Store mother and baby personal | Firebase Firestore |



| | | | |
|--------------------------------|-----------------------|--|---|
| | | information (name, birth date, gender, etc.) | |
| Health Tracking | Mother Health Tracker | Track mother's health metrics (weight, medical records, allergies, milestones) | Firebase Firestore |
| Health Tracking | Baby Health Tracker | Track baby's health metrics (weight, height, milestones, allergies) | Firebase Firestore |
| Reminders | Reminder Management | Allow user to create, edit, delete custom reminders independently of schedules | Firebase Firestore |
| Health Scheduling | Health Schedule | Manage baby's health appointments, vaccinations, and other scheduled activities | Firebase Firestore |
| Analytics & Reports | Records & Graphs | Generate charts and reports from health tracker data for visualization | Firebase Firestore |
| Notifications | Notifications | Send alerts for health schedules and reminders; track status (delivered, read, missed) | Firebase Firestore / Local device cache |



| | | | |
|------------------------|---------------------|--|-------------------------|
| Settings | Settings Management | Store user preferences: notification settings, app theme, default baby, language | Firebase Firestore |
| User Management | Logout | Terminate user session and secure app access | Firebase Authentication |

Table 35 Data Design

1.Data Dictionary

| Terminology | Description |
|----------------------|---|
| Data Object: Mother | Entity representing the main user (mother). Handles registration, login, profile access, health tracking, reminders, and notifications. |
| Field: motherId | String, unique ID of the mother. |
| Field: userName | String, username used for login. |
| Field: email | String, unique email address of the mother. |
| Field: password | String, encrypted password for authentication. |
| Field: isLoggedIn | Boolean, indicates login status of the mother. |
| Data Object: Profile | Stores personal information of the mother and baby. Required for using app features. |
| Field: profileId | String, unique profile ID. |
| Field: motherName | String, full name of the mother. |
| Field: motherAge | Integer, age of the mother. |
| Field: babyName | String, name of the baby. |
| Field: babyDOB | Date, baby's date of birth. |
| Data Object: Setting | Manages application and account-related settings. |



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| | |
|-------------------------------------|---|
| Field: settingId | String, unique ID for settings. |
| Field: theme | String, selected application theme. |
| Field: email | String, email associated with settings. |
| Field: password | String, updated password. |
| Data Object: Reminder | Stores reminders for health, vaccination, or events. Can be created, edited, viewed, or deleted. |
| Field: reminderId | String, unique reminder ID. |
| Field: title | String, title of the reminder. |
| Field: date | Date, reminder date. |
| Field: time | Time, reminder time. |
| Data Object: HealthSchedule | Manages scheduled health activities for mother or baby. Tracks which schedules are selected. |
| Field: scheduleId | String, unique health schedule ID. |
| Field: name | String, name of the schedule. |
| Field: type | String, type of schedule (mother/baby). |
| Field: isSelected | Boolean, indicates selected schedule. |
| Data Object: MotherHealthTracker | Stores the mother's health tracking records including measurements and medical information. |
| Field: motherRecordId | String, unique record ID. |
| Field: glucoseLevel | String, glucose measurement. |
| Field: bloodPressure | String, blood pressure reading. |
| Field: weight | String, weight of the mother. |
| Field: medicalRecord | String, additional medical information. |
| Field: date | Date, record entry date. |
| Data Object: BabyHealthTracker | Stores baby's health and growth records including weight, milestones, allergies, and medical notes. |



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| | |
|------------------------------|--|
| Field: babyRecordId | String, unique baby health record ID. |
| Field: weight | String, baby weight. |
| Field: milestone | String, baby growth milestone. |
| Field: allergy | String, allergy information. |
| Field: babyMedicalRecord | String, medical notes related to baby. |
| Field: date | Date, record entry date. |
| Data Object: RecordsAndGraph | Handles visualization of health records and graphs for both mother and baby. |
| Field: graphId | String, unique graph ID. |
| Field: recordType | String, type of health record. |
| Field: recordName | String, name of the record. |
| Data Object: Notification | Stores system-generated alerts and messages. Tracks read/unread status. |
| Field: notificationId | String, unique notification ID. |
| Field: message | String, notification message content. |
| Field: status | String, notification status (read/unread). |

Table 36 ER-diagram Data Dictionary

4.7 User Interface Design

| User Type | Screen Name | Screen Heading | UI Description |
|-----------|--------------|----------------|---|
| Mother | Registration | Create Account | Form to enter username, email, password, and confirm password. Includes “Already have an account?” button to navigate to Login. |
| Mother | Login | Welcome Back | Form to enter email and password. Includes “Forgot Password?” link and email |



| | | | |
|--------|-----------------------|-----------------------|---|
| | | | verification if account is not verified. |
| Mother | Home | Mom N Baby Dashboard | Displays navigation to Profile, Mother Health Tracker, Baby Health Tracker, Reminder, Notification, and Settings. Shows quick summary of health data and reminders. |
| Mother | Profile | My Profile | Form to add or edit mother and baby details: mother name, age, baby name, baby DOB. Mandatory for accessing other features. |
| Mother | Mother Health Tracker | Mother Health Tracker | Allows mother to enter health data: glucose level, blood pressure, weight, and medical records. Displays history of previous entries. |
| Mother | Baby Health Tracker | Baby Health Tracker | Allows mother to enter baby's health data: weight, milestone, allergies, and baby medical records. Displays history of previous entries. |
| Mother | Health Schedule | Health Schedule | Displays scheduled health activities for mother and baby. Mother can select or update schedules. |
| Mother | Reminder | My Reminders | Allows mother to add, edit, view, or delete reminders. Shows reminders in list format with date and time. |
| Mother | Notification | Notifications | Displays system-generated messages and alerts. Can mark |



| | | | |
|--------|-----------------|------------------------|--|
| | | | as read/unread. |
| Mother | Settings | App & Account Settings | Allows mother to change theme, update email, change password. Supports email verification workflow for updating email. |
| Mother | Forgot Password | Reset Password | Allows mother to request password reset via email link and set new password. |

Table 37 User Interface Design

1. Screen Images

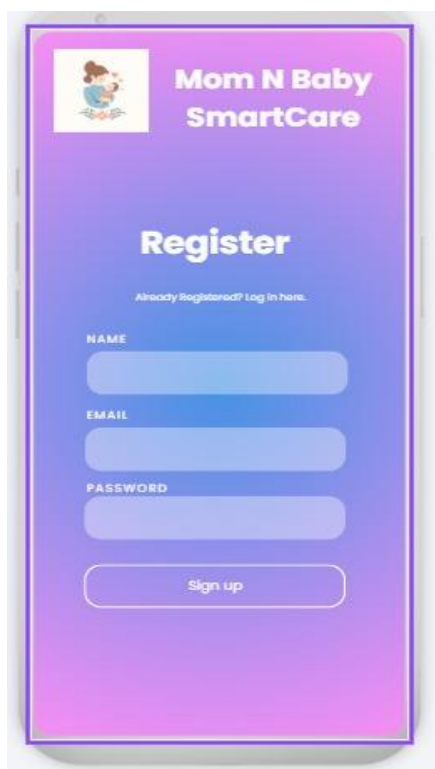


Figure 39 Register Screen Image



Figure 40 Login Screen Image

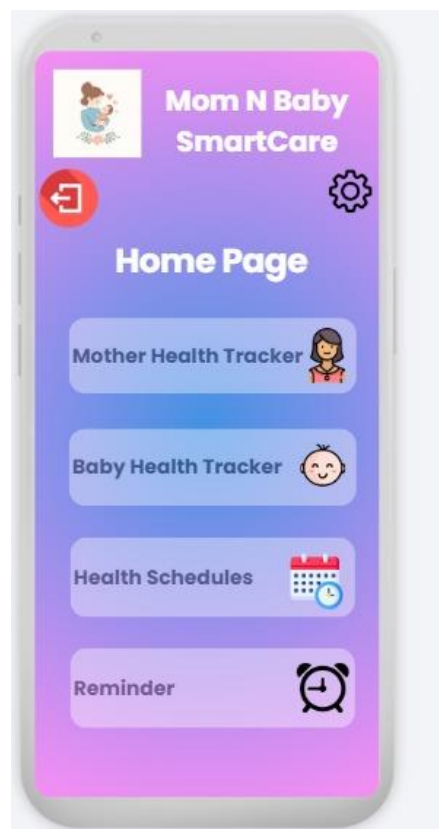


Figure 41 Home Page Screen



Figure 42 Mom N Baby Profile Screen Image



Figure 43 Mother Health Tracker



Figure 44 Baby Health Tracker



Figure 45 Mother Health Record

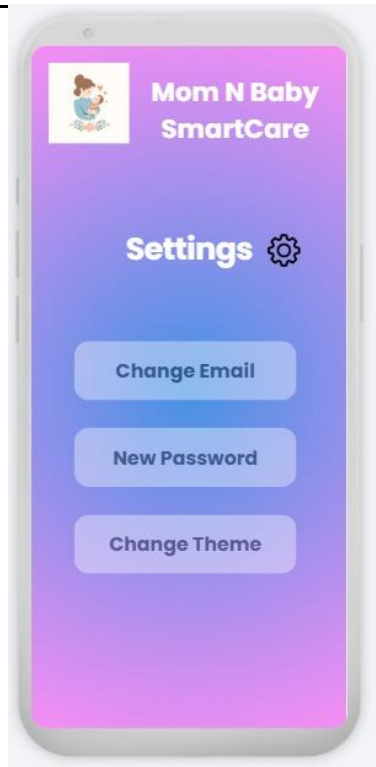


Figure 46 Settings

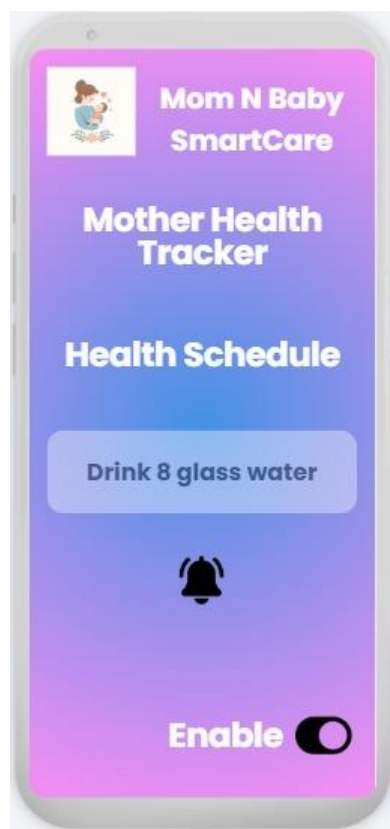


Figure 47 Health Schedule



Figure 48 Logout

| Screen Object | Action by User | System Response |
|------------------------|-----------------------------|--|
| Username field | Mother enters username | System accepts input |
| Email field | Mother enters email address | System accepts input |
| Password field | Mother enters password | System hides password characters |
| Confirm Password field | Mother re-enters password | System validates password match |
| Register button | Mother clicks register | System verifies data and creates account |



| | | |
|-----------------|------|---|
| Error message | None | Shown if validation fails |
| Success message | None | Shown if registration is successful |
| Login Screen | None | Redirects to login screen after success |

Table 38 Registration Screen Objects and Actions

| Screen Object | Action by User | System Response |
|-----------------|--------------------------------|---------------------------------------|
| Email field | Mother enters registered email | System accepts input |
| Password field | Mother enters password | System hides password characters |
| Login button | Mother clicks login | System verifies credentials |
| Error message | None | Shown if login fails |
| Success message | None | Shown if login is successful |
| Home Page | None | Displays mother dashboard after login |

Table 39 Login Screen Objects and Actions

| Screen Object | Action by User | System Response |
|-------------------|------------------------------|------------------------|
| Mother Name field | Mother enters name | System accepts input |
| Mother Age field | Mother enters age | System accepts input |
| Baby Name field | Mother enters baby name | System accepts input |
| Baby DOB field | Mother selects date of birth | System records date |
| Add button | Mother clicks add | Profile data is saved |
| Edit button | Mother updates information | System updates profile |



| | | |
|--------------|----------------------|-----------------------------|
| View profile | Mother views profile | System displays stored data |
|--------------|----------------------|-----------------------------|

Table 40 Mom N Baby Profile Screen Objects and Actions

| Screen Object | Action by User | System Response |
|----------------------|-----------------------|-------------------------|
| Glucose Level field | Mother enters value | System records data |
| Blood Pressure field | Mother enters value | System records data |
| Weight field | Mother enters weight | System records data |
| Digestion Info field | Mother enters info | System records data |
| Add button | Mother adds record | Record is saved |
| Update button | Mother updates record | Record is updated |
| Delete button | Mother deletes record | Record is removed |
| View button | Mother views history | System displays records |

Table 41 Mother Health Tracker Screen Objects and Actions

| Screen Object | Action by User | System Response |
|----------------------|-------------------------------|--------------------------|
| Weight field | Mother enters baby weight | System records data |
| Milestone field | Mother enters milestone | System records milestone |
| Allergy Info field | Mother enters allergy details | System records data |
| Medical Record field | Mother enters medical notes | System records data |
| Add button | Mother adds record | Record is saved |
| Update button | Mother updates record | Record is updated |
| Delete button | Mother deletes record | Record is removed |
| View button | Mother views history | System displays records |

Table 42 Baby Health Tracker Screen Objects and Actions

| Screen Object | Action by User | System Response |
|-------------------|----------------------------|------------------------|
| Record Type | Mother selects record type | System filters records |
| View Graph button | Mother clicks button | Graph is generated |
| View Records | Mother views list | Records are displayed |
| Delete Record | Mother deletes record | Record is removed |

Table 43 Mother Health Records and Graph Screen Objects and Actions

| Screen Object | Action by User | System Response |
|-----------------|---------------------------|-------------------------|
| Schedule list | Mother views schedules | System displays list |
| Select button | Mother selects schedule | Schedule is activated |
| Deselect button | Mother deselects schedule | Schedule is deactivated |
| View button | Mother views details | Schedule details shown |

Table 44 Health Schedule Screen Objects and Actions

| Screen Object | Action by User | System Response |
|---------------|------------------------------|---------------------------|
| Title field | Mother enters reminder title | System accepts input |
| Date field | Mother selects date | System records date |
| Time field | Mother selects time | System records time |
| Add button | Mother creates reminder | Reminder is saved |
| Edit button | Mother edits reminder | Reminder is updated |
| Delete button | Mother deletes reminder | Reminder is removed |
| View reminder | Mother views reminders | System displays reminders |

Table 45 Reminder Screen Objects and Actions

| Screen Object | Action by User | System Response |
|-----------------|----------------------------------|------------------------|
| Change Email | Mother updates email | System saves new email |
| Change Password | Mother enters old & new password | Password is updated |
| Change Theme | Mother selects theme | Theme is applied |

Table 46 Settings Screen Objects and Actions

| Screen Object | Action by User | System Response |
|---------------|----------------------|---------------------------------------|
| Logout button | Mother clicks logout | Session ends and login screen appears |

Table 47 Logout Screen Objects and Actions

4.8 Design Decisions

| Design Aspect | Approach Used | Reason |
|----------------|--|---|
| Coding Style | Class-Based (Object-Oriented) Approach | The system is developed using classes such as Mother, Profile, BabyHealthTracker, MotherHealthTracker, Reminder, and Notification. This improves code organization, reusability, and maintainability. |
| User Structure | Single Primary User Model | The application is designed around a single primary user (Mother) to keep the system simple |



| | | |
|--------------------|---------------------------------|---|
| | | and focused on mother and baby care without unnecessary role complexity. |
| Authentication | Email and Password Based Login | Secure authentication using email and password ensures user privacy and protects sensitive health information. |
| Profile Management | Separate Profile Entity | Mother and baby information is stored in a dedicated Profile entity, allowing easy updates and better data organization. |
| Health Tracking | Separate Health Tracker Modules | MotherHealthTracker and BabyHealthTracker are implemented as separate modules to clearly distinguish between mother and baby health records. |
| Reminder System | Event-Based Reminder Module | Reminders are designed as independent entities so mothers can easily add, edit, or delete reminders for vaccinations, checkups, and daily care. |
| Health Scheduling | Selectable Health Schedules | Health schedules allow mothers to select or deselect predefined schedules, making the system flexible and user-friendly. |



| | | |
|--------------------|--------------------------|---|
| Data Visualization | Records and Graph Module | Health records are visualized using graphs to help mothers easily understand health trends over time. |
|--------------------|--------------------------|---|

Table 48 Data Decisions

4.9 Summary

In this System Design Specification, the overall design of the **Mom N Baby SmartCare** application was presented, covering key modules such as authentication, profile management, mother and baby health tracking, reminders, schedules, notifications, and settings. The product perspective, system structure, and design constraints were discussed to show how different components interact while keeping the application simple, secure, and efficient for daily use. Diagrams including the **Use Case, Class, and ER diagrams** were used to explain system behavior and data relationships. An object-oriented design approach was adopted to improve maintainability and scalability, resulting in a user-friendly and well-structured health management system for mothers and babies.

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