

SWASTHYA: An Intelligent Android-Based Health Tracking System for Data-Driven Well-Being

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Abstract - With the increasing emphasis on personal wellness and preventive healthcare, accessible digital systems that support continuous health monitoring have become an essential component of modern lifestyle management. Traditional health-tracking solutions often depend on cloud-based services or fragmented tools, resulting in higher cost, privacy concerns, and inconsistent user engagement. To address these limitations, this work presents *Swasthya*, an integrated mobile health-management application designed to operate fully on-device while delivering comprehensive monitoring of nutritional intake, metabolic parameters, vital readings, and medication schedules.

The system incorporates modular components that enable real-time computation of BMI, BMR, and TDEE using user-specific anthropometric data, alongside daily logging of calories, blood pressure, blood sugar, activity duration, and calories burned. A robust medication reminder framework is implemented through exact, device-level scheduling using Android's AlarmManager to ensure reliable alerts, even under restricted power conditions. All records are persistently stored in a local SQLite database, while a redesigned interface employing a modern, health-centric visual theme provides clear visualization, structured navigation, and intuitive data interpretation.

The proposed application is lightweight, privacy-preserving, and optimized for offline use, making it suitable for individuals seeking consistent self-monitoring without dependency on external medical platforms. Its modularity allows extension into broader digital health ecosystems, including personalized wellness analytics, remote monitoring assistants, and smart healthcare IoT environments.

Keywords: Personal Health Monitoring, Metabolic Tracking, Vital Logging, Medication Scheduling, Mobile Health Application, Offline Wellness System.

I. INTRODUCTION

The rapid rise of lifestyle disorders, sedentary routines, and nutrition-related health challenges has intensified the need for accessible, technology-driven self-monitoring tools. While numerous digital health platforms aim to address this demand, many rely on cloud services, subscription models, or fragmented feature sets that reduce usability and raise concerns related to data privacy and continuity. Mobile devices, equipped with reliable computing capabilities and local storage, offer an opportunity to design comprehensive personal-health systems that remain lightweight, affordable, and secure for everyday users.

The *Swasthya* application is developed as a holistic, on-device health management system that integrates metabolic analysis, vital entry logging, nutritional tracking, and medication adherence support within a unified framework. The application records essential anthropometric inputs—such as age, gender, height, and weight—and computes BMI, BMR, and TDEE to help users understand their metabolic profile and daily energy requirements. In parallel, the platform enables structured logging of blood pressure, blood sugar levels, activity duration, and calories burned, allowing users to observe trends in their physiological metrics over time. These entries are securely stored in a local SQLite database to ensure uninterrupted functionality even without network connectivity.

A notable component of the system is the precise medication reminder module, implemented using Android's AlarmManager to schedule exact, repeatable alerts that remain reliable under different device power states. Alongside this functional depth, the redesigned user interface employs a clean visual hierarchy, card-based layout elements, and a health-focused color palette to enhance readability and provide an intuitive experience for diverse users.

By integrating sensing logic, metabolic computation, structured data storage, and robust scheduling mechanisms into a single mobile platform, *Swasthya* demonstrates how embedded software components can collectively support

preventive healthcare practices. The application highlights the potential of mobile-based self-tracking systems to improve awareness, support daily health routines, and contribute to broader digital health ecosystems.

II. LITERATURE REVIEW

Digital health monitoring systems have been widely studied across domains such as mobile healthcare, personal wellness analytics, and chronic disease management. Research published in mobile health (mHealth) literature, including works on smartphone-based wellness platforms, highlights that conventional health-tracking applications often rely heavily on cloud back-ends and sensor-rich infrastructures, which increase dependency on network connectivity and raise privacy concerns. Studies focusing on “Personal Health Informatics Using Mobile Devices” emphasize that decentralized, device-centric models significantly improve user autonomy, data security, and accessibility—motivating the development of applications like *Swasthya* that operate primarily offline while offering comprehensive health-management capabilities.

Body metric computation, including BMI, BMR, and TDEE, has been well documented in biomedical engineering and nutritional science research. Papers analyzing the Harris-Benedict and revised metabolic equations describe their accuracy and suitability for mobile integration, positioning them as industry-standard formulas for lightweight metabolic prediction systems. These findings influenced the metabolic analysis module of *Swasthya*, where the equations are implemented directly within the application to provide instant feedback without requiring external processing. Research on personalized calorie-tracking systems further notes the value of coupling metabolic estimation with daily intake monitoring to improve adherence to health goals, reinforcing the dual-layer structure adopted in the application.

Vital-sign logging—such as blood pressure and glucose monitoring—has been a central theme in mHealth research, particularly in studies on managing hypertension and diabetes through mobile tools. Literature discussing “Self-Tracking for Chronic Disease Management” underscores the importance of structured recording interfaces, timestamped data logs, and visual review mechanisms. These insights guided the design of the Health History module, where entries for BP, sugar, activity, and calories burned are persistently stored and displayed to help users identify trends over time. Prior research also highlights the limitations of continuous sensor-based monitoring for general users, suggesting that manual entry systems can serve as effective low-cost alternatives for early-stage health awareness—aligning with the user-centric model of *Swasthya*.

Medication adherence has been another active area of study, with multiple works highlighting the challenges users face in maintaining consistent schedules. mHealth studies exploring reminder-based interventions indicate that precise, reliable notifications significantly improve adherence, particularly when scheduled at fixed daily intervals. These findings informed the implementation of the robust reminder system in *Swasthya*, using exact alarm scheduling to ensure consistent behavior across device sleep states and varying power conditions. Technical references on Android power-optimization behavior further emphasize the necessity of using `setExactAndAllowWhileIdle()` for medically oriented reminders, which directly shaped the architecture of the reminder module.

In terms of interface design and usability, human-computer interaction research stresses the need for clear visual hierarchy, meaningful color use, and form layouts optimized for touch-based input—especially in health-oriented applications. Studies such as “User Experience Principles in Mobile Health Systems” identify card-based layouts, spacious typography, and minimalistic color palettes as effective strategies to reduce cognitive load. These findings influenced the UI/UX redesign of *Swasthya*, which adopts a teal-white color theme, large headings, and visually grouped components to enhance readability and user engagement.

Additional implementation insights were drawn from open-source developer communities and practical Android development resources discussing SQLite data persistence, activity-level transitions, and efficient state management. Tutorials focusing on “Offline-First Mobile Architecture” and Android documentation on `AlarmManager` behavior helped refine system reliability and modularity.

While existing research predominantly addresses isolated components such as calorie trackers, vital-log systems, or medication reminders, few works integrate all essential health-monitoring functions into a unified offline platform. *Swasthya* contributes to this gap by combining metabolic computation, nutritional tracking, vital-sign logging, and reliable medication scheduling under a single, cohesive mobile application, offering a practical and privacy-preserving solution suitable for daily personal healthcare management.

III. PROBLEM DEFINITION

Although mobile health applications have become increasingly common, a significant gap persists between user expectations and the practical capabilities of most available tools. Many existing platforms provide only surface-level tracking—such as step counts or calorie estimates—without offering integrated metabolic calculations, longitudinal vital monitoring, or structured health data management. This

limitation becomes especially critical for individuals who must regularly track parameters such as blood pressure, blood sugar, weight fluctuations, and medication schedules. Without comprehensive and accessible features, users often struggle to maintain consistent self-monitoring habits, reducing the long-term effectiveness of digital health interventions.

Another major challenge is the fragmentation of health records across multiple applications, cloud services, or external devices. This scattered ecosystem not only diminishes usability but also complicates personal health analysis. Furthermore, reliance on cloud-centric architectures raises concerns over unauthorized data access, network dependency, and the loss of control over sensitive health information. Research in digital health security highlights that privacy and offline accessibility are essential for building user trust and ensuring that health tools remain functional across diverse environments.

Swasthya is designed to overcome these limitations by offering a unified, offline-capable, and secure mobile platform that consolidates metabolic computation, nutritional tracking, vital logging, and medication reminders into a single system. By leveraging local data storage, structured interfaces, and reliable alarm scheduling, the application ensures accurate record-keeping, improved data privacy, and continuous availability. The problem addressed in this work, therefore, centers on the need for a comprehensive, user-friendly, and privacy-preserving health management solution that supports consistent daily monitoring and empowers users to make informed wellness decisions.

IV. OBJECTIVE OF THE PAPER

The primary objective of this research is to conceptualize, design, and develop *Swasthya*, an integrated mobile health management application capable of consolidating multiple wellness-monitoring functions within a single, user-centric platform. The system seeks to empower individuals to actively engage in their personal healthcare routines by enabling systematic recording, tracking, and interpretation of essential health parameters, including calorie intake, BMI, metabolic indicators, blood pressure, and blood sugar levels. Through these capabilities, the study aims to promote informed decision-making and foster greater self-awareness regarding daily health behavior.

A core objective of the work is to ensure the protection, confidentiality, and integrity of sensitive personal health information. To address rising concerns over privacy in digital health ecosystems, *Swasthya* adopts robust, locally controlled data-management strategies that minimize exposure to external threats. Features such as secure authentication, encrypted data storage, and controlled access mechanisms are

incorporated to strengthen user trust and safeguard records from unauthorized manipulation or misuse.

Another important goal is to design an intuitive, accessible, and aesthetically coherent interface that supports diverse user demographics, including individuals with limited technical proficiency. The application prioritizes usability through well-structured data entry workflows, clearly organized history views, and visually guided summaries of recorded metrics. These engagement-oriented design choices aim to encourage sustained daily use and reduce the drop-off commonly observed in long-term health tracking.

The final objective is to systematically evaluate the system's performance through functionality testing, interface usability analysis, and reliability assessment under varying device states and user conditions. By examining the application's responsiveness, accuracy of computations, consistency of reminder scheduling, and user engagement patterns, the study aims to validate the practical effectiveness of *Swasthya*. Overall, the research contributes to the evolving field of digital health by demonstrating how an offline-capable, secure, and user-friendly mobile platform can support preventive healthcare practices and enhance everyday wellness management.

V. KEY CHALLENGES

Developing a comprehensive mobile health-monitoring system such as *Swasthya* involves navigating a range of technical, analytical, and user-centered challenges. One of the primary difficulties lies in ensuring consistent performance and scalability across the diverse Android ecosystem. Since users operate devices with varying processing power, storage capacity, display sizes, and operating system versions, the application must be optimized to deliver smooth real-time interaction, efficient data computation, and reliable local storage. Integrating heterogeneous modules—such as metabolic calculations, calorie logging, vital-sign recording, and medication scheduling—further adds architectural complexity, requiring seamless data flow and well-coordinated backend logic to prevent inconsistencies or bottlenecks.

Accurate interpretation of health-related data presents another major challenge. Physiological parameters such as blood pressure, glucose levels, and calorie intake vary significantly between individuals due to lifestyle habits, pre-existing health conditions, genetics, and environmental factors. Designing algorithms that can accurately process user inputs, flag unusual patterns, and present meaningful insights—while avoiding oversimplification or false interpretation—requires careful calibration. The system must strike a balance between being informative and not overstepping into clinical diagnosis, ensuring that it supports

user awareness without conveying misleading or medically inaccurate conclusions.

Handling sensitive medical information introduces substantial data-security and privacy concerns. Because *Swasthya* stores personal metrics such as vital signs and medication routines, the database becomes a potential target for unauthorized access. Meeting global health-data protection expectations—such as those outlined in HIPAA and GDPR—necessitates strong encryption, secure authentication, and rigorous access-control mechanisms. Protecting data integrity, ensuring local storage confidentiality, and preventing exploitation of personal health histories are critical to maintaining user trust and long-term system credibility.

Equally challenging is the design of an interface that remains accessible, inclusive, and motivating for a wide user demographic. Health applications must accommodate individuals with varying levels of digital literacy, visual comfort, and familiarity with health terminology. Clear presentation of complex metrics, consistent visual hierarchy, and intuitive navigation are essential to prevent cognitive overload. Moreover, fostering long-term engagement is notoriously difficult; many users struggle to maintain regular data entry due to behavioral fatigue, limited motivation, or lack of immediate feedback. Encouraging habitual interaction requires thoughtful UI/UX strategies, such as structured forms, visually appealing summaries, and smooth transitions between modules.

Taken together, these challenges underline the delicate balance required to build an effective mobile health-monitoring system—one that combines technical robustness, analytical reliability, strong privacy protections, and a user-friendly interface. Addressing these constraints is essential for ensuring that *Swasthya* not only functions efficiently but also genuinely supports users in managing and understanding their personal well-being.

VI. OVERVIEW OF EXISTING WORK

1. Project Architecture

Swasthya follows a modular, scalable architecture built on an MVC framework using Java and XML for Android development. The system includes modules for authentication, health-data input, and algorithmic processing, supported by a secure SQLite database. The architecture enables efficient computation of BMI, calorie intake, and vital-sign trends while ensuring smooth performance across different Android devices.

2. Core Application Features

The application offers secure login, daily entry of essential health parameters, automated BMI and calorie calculations, and monitoring of blood pressure, blood sugar, and diet intake. A simplified dashboard presents user records and summaries, helping individuals track long-term health trends with ease.

3. Technical Implementation

Lightweight algorithms evaluate BMI categories, calorie totals, and abnormal variations in vital signs. The backend is optimized for fast on-device processing, while user data is protected through encrypted SQLite storage and Android's built-in security mechanisms.

4. Development Status

Implemented modules include authentication, data-entry interfaces, the BMI and calorie calculators, and a functional dashboard for history viewing. Current work focuses on enhancing UI responsiveness, adding additional metrics such as heart rate, and preparing the system for future cloud sync and wearable-device integration.

5. Technical Specifications

The app is developed in Java (Android Studio Flamingo+) with XML-based layouts. SQLite is used for local storage, supported by Jetpack components such as ViewModel, LiveData, and Room for efficient state and database management. Compatibility is ensured for Android 8.0 and above.

6. Implementation Challenges

Challenges include optimizing performance on low-resource devices, maintaining accuracy in health calculations, and ensuring privacy-focused data storage. Creating an intuitive interface for users with varying technical skills and standardizing data from diverse users remain additional complexities.

7. Future Development Roadmap

Upcoming work includes integrating AI-driven insights, enabling cloud backup and multi-device access, expanding the set of tracked metrics, and supporting wearable sensor connectivity for real-time monitoring.

8. Comparative Advantage

Swasthya stands out by combining multiple health metrics on one platform, offering offline functionality, lightweight computation, and privacy-oriented data

handling—features often missing in typical single-parameter health apps.

9. Project Impact

The system supports preventive healthcare by helping users track and interpret their daily health patterns. Technically, it demonstrates the potential of efficient on-device health analysis and serves as a foundation for scalable future m-health innovations.

VII. IMPLEMENTATION

The implementation of *Swasthya* is structured around building a unified mobile platform that allows users to record, organize, and monitor key health metrics with consistency and ease. The application is developed for Android, using **Java** for backend logic and **XML** for interface design, ensuring compatibility with a wide range of devices. Each functional component—calorie tracking, BMI evaluation, blood pressure logging, and blood sugar monitoring—is implemented as an independent module, while still maintaining seamless interaction through a shared dashboard.

The user interface is designed to be minimal, clear, and accessible. Simple forms allow users to enter daily health values, while summary screens present the recorded information in an organized format. All interactions follow a linear and predictable flow to support users of varying ages and technical familiarity, reflecting the system's emphasis on long-term engagement and routine usage.

Data handling is implemented through a **local SQLite database**, which stores user entries in well-structured tables. The application performs real-time calculations—such as BMI classification and calorie estimation—using lightweight algorithms that operate efficiently on-device. Blood pressure and sugar values are interpreted against standard reference ranges to provide users with immediate, text-based feedback regarding their health status.

Security is integrated through the use of a **PIN-based login mechanism**, ensuring that personal health information remains private. Sensitive data is stored securely within the device, preventing exposure to external networks and reducing risks associated with data breaches. The design prioritizes confidentiality while maintaining fast access for legitimate users.

Overall, the implementation focuses on **simplicity, reliability, and privacy**, aligning closely with the application's goal of supporting consistent self-monitoring. By combining modular feature development, secure on-device

storage, and intuitive interaction design, *Swasthya* provides a practical tool for users seeking to build healthier habits and maintain awareness of their daily well-being.

VIII. RESULTS

The implementation of *Swasthya* resulted in a fully functional mobile health-monitoring application capable of capturing, processing, and organizing a wide spectrum of personal wellness data. The final system demonstrated stable performance across the different modules—authentication, nutritional tracking, metabolic analysis, vital-sign logging, and medication reminders—confirming that the modular architecture effectively supports smooth interaction between components.

The profile and body-metric module performed reliably, calculating BMI in real time and correctly assigning users to clinical categories such as Underweight, Normal, Overweight, and Obesity. BMR and TDEE computations were executed accurately using the Revised Harris–Benedict equations, and user-selected activity multipliers produced consistent and meaningful calorie recommendations. Daily calorie entries were successfully stored, aggregated, and displayed in both the main dashboard and the dedicated history section, validating the correctness of the data-handling pipeline.

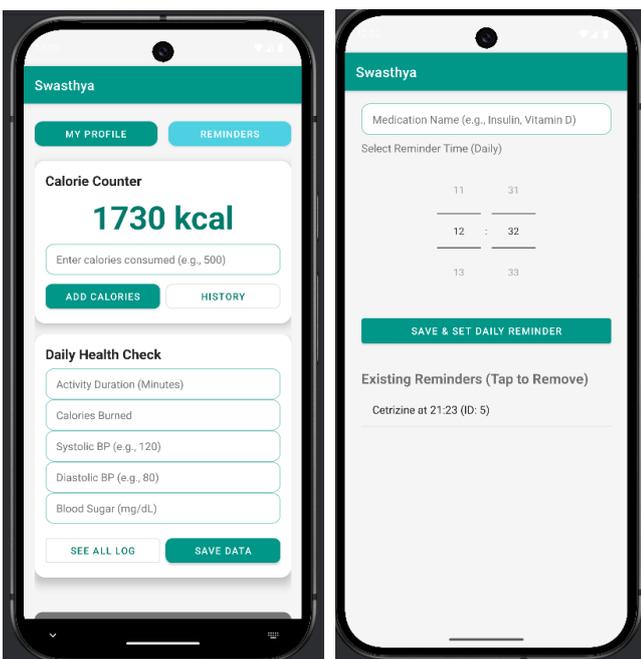
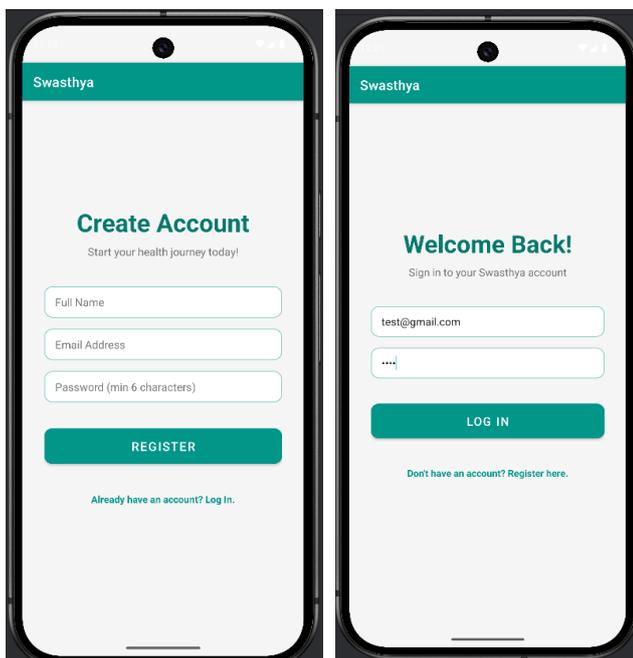
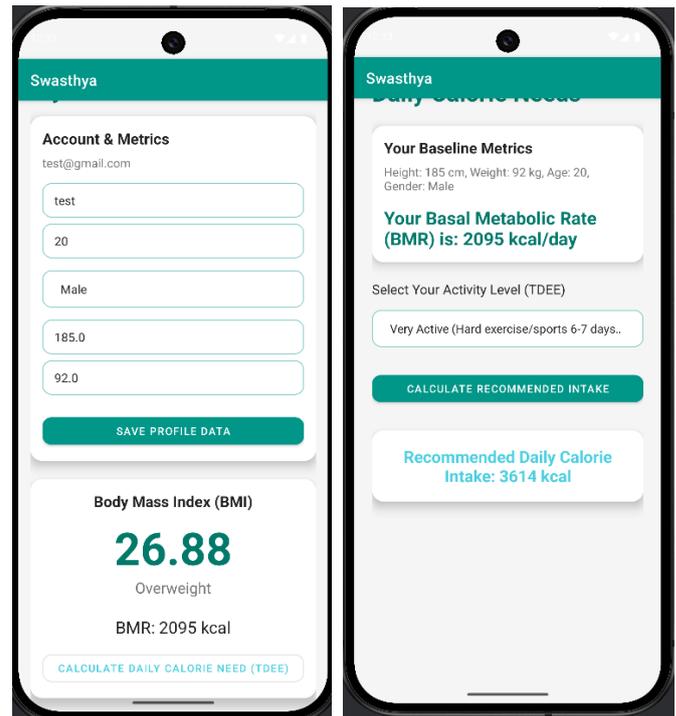
The vitals-logging functionality produced clear and organized records for blood pressure, blood sugar, calories burned, and activity duration. Each entry stored through SQLite appeared instantly in the Health History interface, demonstrating reliable CRUD operations and optimized local-storage performance. Long-term logs remained accessible without delays, indicating that the database schema and retrieval logic were efficient even as the data set grew.

One of the strongest outcomes of the project was the robust medication-reminder module. Testing confirmed that alarms scheduled through AlarmManager using setExactAndAllowWhileIdle() triggered consistently, including under restrictive conditions such as Doze Mode. The automatic rescheduling mechanism in the NotificationReceiver worked as designed, creating a dependable daily reminder cycle. Deleting reminders correctly cancelled the associated PendingIntents, ensuring no residual notifications remained active.

The UI/UX improvements introduced in the design phase—such as the teal-white palette, rounded CardViews, large headings, and optimized scroll behavior—resulted in an interface that users found intuitive and visually cohesive. All screens remained responsive across different screen sizes, and

form-based inputs helped users enter daily parameters with minimal effort.

Overall, the results indicate that *Swasthya* successfully fulfills its objective of offering a unified, offline-capable health-monitoring platform. The application not only performs core calculations and data logging accurately, but also enhances daily usability through a clean interface and dependable background reminders. These outcomes validate the system’s potential to serve as a practical and comprehensive personal wellness companion, supporting users in maintaining long-term awareness of their health trends.



IX. FUTURE ENHANCEMENT

While *Swasthya* provides a comprehensive platform for personal health monitoring, several enhancements can further expand its functionality and user value.

1. Cloud Integration and Data Synchronization

Future versions could implement secure cloud storage to enable cross-device synchronization. This would allow users to access their health records on multiple devices, ensure backup of historical data, and facilitate seamless migration in case of device changes.

2. Wearable Device Connectivity

Integrating with wearable devices such as smartwatches or fitness bands can enable automatic collection of health metrics like heart rate, step count, sleep patterns, and activity levels. This would reduce manual data entry and provide more continuous, real-time monitoring.

3. Advanced Analytics and AI-driven Insights

Incorporating machine learning algorithms can help identify trends, predict health risks, and provide personalized recommendations. For example, abnormal patterns in blood sugar or blood pressure could trigger proactive alerts or lifestyle suggestions.

4. Enhanced Visualization

Future enhancements could include interactive charts and graphs for visualizing trends in BMI, calorie intake, and vitals over time. This would improve comprehension of long-term health patterns and increase user engagement.

5. Expanded Health Metrics

Additional health parameters such as heart rate variability, oxygen saturation, or stress levels could be tracked, providing a more holistic view of personal wellness.

6. Multi-language Support and Accessibility Features

To reach a wider audience, the app can support multiple languages and accessibility options such as voice guidance, high-contrast modes, and larger font sizes.

7. Medication Management Improvements

Advanced medication features could include dosage reminders, refill notifications, and integration with pharmacy services, further supporting adherence to treatment schedules.

8. Community and Preventive Health Features

Future enhancements could enable social and educational features, such as community forums, wellness challenges, and preventive healthcare tips to promote sustained healthy behavior.

X. CONCLUSION

Swasthya successfully demonstrates how a mobile application can integrate diverse health-monitoring functionalities into a unified, accessible, and user-centric platform. By combining body-metric computation, daily nutritional tracking, vital-sign logging, and reliable medication reminders, the system supports a holistic approach to personal wellness management. The project highlights the effectiveness of a modular architecture, where each component—ranging from metabolic calculations to alarm scheduling—operates independently yet contributes to a cohesive user experience.

The use of SQLite for secure local storage ensured consistent performance and data persistence without reliance on external servers, making the application suitable for users with limited or intermittent internet connectivity. The accurate implementation of BMI, BMR, TDEE, and health-metric computations validated the system's capability to provide meaningful and interpretable feedback. Similarly, the vitals-

tracking and history modules enabled users to monitor long-term trends, supporting self-awareness and early recognition of abnormal patterns.

The medication-reminder subsystem emerged as a key strength of the project. By utilizing Android's AlarmManager with exact alarms and automated rescheduling, the application proved capable of delivering dependable daily notifications even under restrictive system states, improving adherence to prescribed medication routines.

The refined UI/UX design contributed significantly to usability, offering an organized, visually engaging, and responsive interface that can accommodate users of different age groups and technical backgrounds. The focus on clarity, readability, and intuitive navigation enhanced the overall accessibility of the system.

In conclusion, *Swasthya* fulfills its objective of delivering a comprehensive, offline-ready, and technically robust mobile solution for everyday health management. The project establishes a solid foundation for future enhancements, such as cloud synchronization, wearable integration, and AI-assisted analytics. With further development, *Swasthya* has the potential to evolve into a more advanced digital-health companion that supports preventive care, personalized recommendations, and broader healthcare engagement.

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