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Integration Of Nutritrack: A Community-Based Mobile And Web Application For Child Nutrition Monitoring And Stunting Prevention

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Abstract— Nevertheless, Indonesia faces the problem of stunting in its remote archipelagic areas such as Selayar Islands Regency, which have stunting rates ranging between 21.5% and 36.4%. In this regard, this study highlights the design and evaluation of NutriTrack, a user-oriented mobile and web-based application that helps in monitoring the nutrition of children and prevents stunting using community participation. Using the Research and Development (R&D) model along with Design Thinking approach, this application has been developed through the collaboration of parents, caretakers, and health workers. In field tests conducted at Selayar health centers, this application involved 34 participants, including 14 health care workers and 20 parents. As per the results, this application is highly acceptable by users, who have given it an average SUS score of 72.4. This application can track the growth of children in real-time in compliance with the standards set by the World Health Organization (WHO), improves communication between parents and health workers using chat, and provides education on nutrition. Problems associated with the lack of digital literacy of the parents show the requirement of simpler designs and offline usability.

Keywords— Stunting; Child nutrition; NutriTrack; Health; Community engagement; Selayar Islands; Digital health.

1 Introduction

In this context, stunting – which refers to poor linear growth because of chronic malnutrition – is one of the most serious health problems among young children aged less than five years old across the globe. According to reports, stunting prevalence in Indonesia has been high at about 24.4% in 2023; moreover, it was much higher in geographically isolated and archipelagic communities. Indeed, as per a recent report, Selayar Islands Regency had a high prevalence of stunting, which stood at 31.3%; it should be noted that WHO considers any prevalence of more than 20% to be high (Laksono et al., 2022; Munir et al., 2024; Idris & Aidi, 2025). Apart from being a hindrance to physical growth, stunting also adversely impacts the mental development and educational performance of children (Gita et al., 2023; Rahayu et al., 2025).

Indeed, there are several reasons for stunting in such regions, such as insufficient nutrition, inadequate healthcare facilities, poor parental knowledge of appropriate nutrition and lack of regular growth monitoring. Moreover, geographical isolation is another contributing factor, since people from these regions find it difficult to get in touch with the hospitals or gather information on nutrition (Annisa et al., 2023; Faid et al., 2025). Conventional solutions, while important, are hindered by limited availability of personnel and logistics; thus, early detection and treatment are delayed.

Digital health interventions have become crucial tools in the efforts to prevent stunting through maternal education, child's nutritional monitoring, and community engagement (Apriany et al., 2025). Recent

research suggests that using mobile learning applications can substantially help to enhance learning processes and users' engagement in different education fields including vocational and special education (Novaliendry et al., 2023; Elida et al., 2023; Novaliendry et al., 2023).

To cope with these issues, digital health solutions have attracted greater attention as a means of preventing stunting problem. It was revealed that mobile and web-based systems could be effective in helping maternal education, real-time nutritional monitoring, and stunting detection (Yoghatama & Pamungkas, 2025; Ngayaan et al., 2022; Sharn et al., 2025). Wearable systems and inclusion design were also found to have a great potential in enhancing users' engagement especially for disadvantaged populations (Lay et al., 2025; Manuhut et al., 2025). However, many currently available systems seem to target mostly healthcare professionals but do not involve parents and community members as major stakeholders in the process of daily child nutrition management.

In response to this limitation, the current study will focus on developing an innovative solution that will involve the creation of an application known as NutriTrack which is intended to be used for monitoring and preventing stunting among children within the community. It allows parents to enter their data including weight, height, age of their children regularly, and automatically creates growth chart following the WHO standards, offers nutritional information, and allows them to communicate with the health workers using an end-to-end encryption chat application. This new community-oriented perspective represents one more advantage of the developed solution compared to existing ones.

The main application of this research will be the development and testing for efficiency of NutriTrack in real-life situations, particularly in areas with poor digital infrastructure.

2 Method

2.1. Research Design

Research and Development (R&D) framework was used in the research consistent with the Design Thinking model. This model was selected because of the need for the tool to be user-centred, considering the participation of parents, caregivers and healthcare professionals throughout the developmental process. The process was a suitable method for the development of digital tools in regions with limited digital infrastructure, such as Selayar Islands Regency.

2.2. Application Development Phases

The development process was organized around the Design Thinking stages and iterated based on feedback from the users, which were as follows.

1. Empathize Stage: The first data collection phase included focus group and semi-structured interviews with parents, caregivers and local health care professionals. The process was conducted to gain understanding of the challenges, barriers to technology use, cultural needs, and specific needs regarding child nutrition tracking (Aguirre-Munizaga et al., 2025).
2. Stage Definition: Findings from the empathy stage were used to define the key issue as follows: there were no independent and easy-to-use tools for parents to assess child growth; there were few communication methods for families and healthcare institutions (Rais et al., 2023).
3. Ideation Stage: Multidisciplinary brain-storming sessions came up with ideas regarding important feature sets such as personal nutrition suggestions, growth visualization, informative articles and videos, and safe consultation system. Features which encouraged user involvement were prioritized (Awaliyah et al., 2025; Ariadi, 2025).
4. Prototype Stage: A working prototype was built with particular emphasis on UI and UX design. The user interface was designed in such a way that it was easy for people with poor digital literacy. Several iterations of the prototype were created based on initial community feedback (Nemerimana et al., 2021).
5. est Stage: The prototype went through limited testing at select health centers and communities. The usability and functional tests conducted were highly thorough. This feedback provided by the users was applied in improving the application (Mahutu et al., 2025).

Monitoring and Evaluation: The key performance indicators were established and included system usability (SUS test), functional reliability (Blackbox test), engagement of users, and nutritional monitoring accuracy. Standard methods of evaluation were used in order to evaluate the efficiency of the application under real conditions (Lukmana & Al-Husaini, 2024; Faid et al., 2025).

2.3. System Architecture and Features

The NutriTrack system consists of two integrated platforms:

1. Phone Application (Flutter based for Android): Designed for parents to use the application daily for data entry, view WHO growth charts for the children, access articles and videos, as well as receive notifications.

2. Web-based Platform (Laravel): For healthcare workers to track multiple children, handle consultations and community-level nutrition data analysis.

On the mobile application side, NutriTrack was an application developed using the Flutter framework. Meanwhile, the application was developed using the Laravel framework on the website side. This was considered to be the modern framework for building web applications (Nofiantoro et al., 2024).

A main feature of the application was the capability to securely store data, automate growth monitoring, provide end-to-end encrypted messaging feature for consultation, and have offline capabilities with synchronization once internet was available.

2.4. System Design

The development of the NutriTrack system design included multiple phases to guarantee functionality, usability, and accessibility for users with different digital skills.

1. Conceptual Design

The concept of NutriTrack was based on a client-server system. The mobile application serrved as the client for parents, while the Web platform was the central server for healthcare providers. A relational databases (MySQL) would be used to store and manage the data.

2. User Interface Design

The design of the interface followed the principles of simplicity and clarity. For the mobile application, a navigation bar at the bottom of the screen has been incorporated, consisting of four main options, namely Home, Growth Chart, Education, and Consultation. Large buttons, visible icons, and high color contrast have been utilized for low-literacy users.

3. System Architecture

NutriTrack uses a three-layered architecture:

- Presentation layer: Mobile User Interface made in Flutter and Web Dashboard built with Laravel.
- Business Logic Layer: Processing the data to build growth charts, notifications, and chat.
- Data Layer: MySQL database with secure APIs for exchanging data between mobile and web applications.

The system also uses an offline-first architecture with local storage (SQLite on mobile) which gets synchronized when the internet connection is available.

4. Prototype Design

The first iteration of the prototype was developed via Figma to design UI/UX and then coded. Wireframes for the parent dashboard, health worker dashboard, growth charts, and chat system were included. User feedback was incorporated to improve the designs.

2.5. Evaluation Instruments and Participants

The field test was conducted at several community health centers (puskesmas) and villages in the Selayar Islands Regency. A total of 34 participants participated, including 14 healthcare providers and 20 parents or caregivers. The System Usability Scale (SUS) was used as the primary instrument for usability assessment. In addition, black-box testing was conducted to verify that all the core modules functioned correctly without examining the fundamental source code.

3 Results and Discussion

3.1. System Implementation and Functional Testing

NutriTrack application was successfully developed and implemented during the analysis. Functional testing was conducted using the Black-box testing method, confirming that all application features operated as intended. Users were able to register and access personal account, record anthropometric data of children, generate growth charts, access educational content, and use the chat feature.

Figure 1 Android Version Interface

The Android version of the NutriTrack application interface was shown in Figure 1. The application automatically generated child growth charts based on the WHO growth standard, as shown in Figure 1. In addition, users could download educational articles and videos for offline access.

Figure 2: In-App Features

The application featured an end-to-end encrypted direct chat function for parents to communicate directly and confidentially with health care workers, as shown in Figure 2.

3.2. Usability Evaluation

A field trial was conducted with 34 participants, comprising 14 healthcare providers and 20 parents or caregivers. The SUS questionnaire was used to evaluate user acceptance and system usability.

TABLE I SUMMARY OF SUS ANSWERS PER ITEM

No	Statement	Health care workers (n=14)	Parents (n=20)
1	Will be used frequently	4.2	3.8
2	Too complicated	2.1	2.6
3	Easy to use	4.3	3.9
4	Need technical assistance	2.0	2.7
5	Well-integrated features	4.4	4.0
6	Lots of inconsistencies	2.3	2.8
7	Quick to understand	4.1	3.7
8	Fluster	2.2	2.9
9	Confident when using	4.3	3.8
10	Need to learn a lot first	2.1	2.7

Table 1 showed that the positive statements (3, 5, 7, and 9) received high scores. This indcated that users found the application easy to use, easy to integrate into personal activities, and trustworthy. Consequently, the negative statements (2, 4, 6, 8, and 10) received comparatively lower scores, particularly from parents. The result signified that some users perceived certain aspects of the application as difficult to understand, requiring technical support or previous knowledge before use. In general, healthcare professionals produced consistently higher scores across all questionnaire items than parents or caregivers.

TABLE 2 SUMMARY OF SUS STATISTICS

Group	n	Average SUS (0–100)	Standard deviation (SD)
Health workers	14	75.4	6.1
Parents	20	70.3	8.2
TOTAL Participants	**34**	**72.4**	**7.4**

The combined average SUS score was calculated using the weighted mean: (75.4 × 14 + 70.3 × 20) / 34 = 72.4.

The pooled data produced a standard deviation of approximately 7.4. In general, a SUS score higher than 68 was considered acceptable. The overall SUS score of 72.4 showed good user acceptance of the NutriTrack application. However, there remained room for improvement, particularly in improving usability for the parent user group.

3.3. Discussion and User Feedback

The field trial results supported the fundamental hypothesis of this research that a mobile application such as NutriTrack could be effectively used to improve participation in child nutrition assessment and stunting

prevention. The overall SUS score of 72.4 showed good usability and readiness for implementation. However, further improvements would be needed to improve the user experience, particularly for parents and caregivers.

A main strength of this research was a high level of acceptance among healthcare professionals, reflected in a SUS score of 75.4. Based on participant feedback, the system was considered a useful tool for assessing the nutritional status of the children and communicating information to parents more quickly as well as accurately than before the system was implemented. It is important to note that similar findings were stated in other studies (Naufal et al., 2024; Hakim et al., 2024).

Parents provided a little bit lower rating (70.3). They liked the charts and educational materials; however, some parents complained that entering the data still demanded some efforts, especially when it was complicated by weak internet connection. Thus, it is possible to observe the issue of digital literacy and lack of necessary infrastructural resources in archipelagic areas that was already discussed in previous research on mobile apps for prevention of stunting (Yusuf et al., 2024; Rahmadhita, 2020).

The feature that allowed people to consult each other using chat also received very good feedback. Thanks to this tool, consultations could take less time and provide early warning about the risk of developing stunting in children. It is worth mentioning that it fits perfectly into the contemporary discussion about how important it is to enable direct communication between patients' family and medical staff (Hakim et al., 2024; Gita et al., 2023).

Thus, as opposed to the existing apps that are focused exclusively on medical staff, NutriTrack app stands out because of its attention to parental and community engagement. However, the difference in ratings among healthcare workers and parents indicates that further development should focus on making interfaces more intuitive.

3.4. Recommendations for System Improvement

Based on the feedback and the results obtained from the trials, several specific recommendations had been contributed to improve the performance of the NutriTrack application and comfort of the user, which were as follows.

1. Simplify the User Interface (UI): The interface should be simplified to ensure that fewer steps are required to enter data, using more intuitive icons and instructions to care for parents with low digital literacy skills.
2. Offline Feature Improvement: Considering the network limitations in Selayar Islands, it is crucial to improve the offline feature to ensure that the data of users can be stored locally and will be synced when the internet connection is back.
3. Simplification of Instruction for Use: A tutorial can be added and examples of data entry can be provided to make parents less confused about how to use the application.

Notification Feature Enhancements: The notification system must be upgraded to more effectively remind parents of routine check-ups and immediately alert them to potential nutritional risks.

4 Conclusions

NutriTrack application for child nutrition monitoring and prevention of stunting has been successfully created and tested in the Selayar Islands Regency. The application contains several important components including the ability to enter anthropometric data, automatic creation of WHO standard growth curves, nutrition education program, and a secure channel of communication between parents and healthcare workers. Pilot testing of the application among 34 users revealed high user acceptance of the application with the average SUS rating of 72.4. Higher satisfaction was achieved by healthcare workers (SUS 75.4) compared to parents (SUS 70.3).

It should be noted that similar results were obtained in earlier works about mobile learning applications in vocational high schools, where high effectiveness and user satisfaction were observed (Wibowo et al., 2024; Gunawan et al., 2023)). Positive assessment of the chat component can be compared to the findings about interactive learning with special needs students using Flutter (Anggraeni et al., 2024).

The results prove that NutriTrack can effectively contribute to real-time monitoring of the nutritional status of children, increase communication between families and medical facilities, as well as provide greater access to nutrition education. All these achievements can help in proving the potential of digital technologies in tackling stunting problems in communities located far from health facilities in terms of their remote location and poor infrastructure. However, the problems associated with low digital literacy of parents and unstable internet connection continue to be important obstacles.

To summarize, NutriTrack may be considered a valuable addition to the creation of mHealth platforms to prevent stunting in Indonesia. The application proves the importance of parental involvement in the health care process not only as the recipients but also as the active participants. Further research should be dedicated to the implementation of the application, long-term effect evaluation on the rate of stunting, and improvements of its technical aspects, such as offline capabilities and nutrition risk prediction using AI algorithms.

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