A Stunting Prevention Application “Nutrimo” (Nutrition Monitoring)

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Abstract. A total of 11 % of children under the age of five years (toddlers) in Tangerang City experienced stunting. Stunting reflects chronic malnutrition during the most critical period of growth and development in early life, the first 1000 days of life. Monitoring the nutritional status is able to prevent stunting especially through Kartu Menuju Sehat (KMS) at an integrated service post (posyandu). Most of the data in KMS is recorded manually, so the risk of data loss or damage is very high. Therefore, mobile application that can monitor the nutritional status automatically is needed to develop. The nutrition monitoring application “Nutrimo” which monitors children’s nutritional status was developed based on Android with anthropometric method and the Waterfall system development method. This application was completed with track record feature and suggestions that parents should take about the nutritional recommendations based on their respective nutritional status. The evaluation results showed that Nutrimo application was easy to use, informative and help to prevent stunting.

1. Introduction
In 2018, 11 % of children under the age of five years (toddlers) in Tangerang City are too short for their age [1]. Low height reflects a failure of children development and a key indicator of undernutrition (stunting) [2]. Stunting becomes a serious health problem that has not been accomplished.

The awareness about nutrition importance during pregnancy and after the recommended period of exclusive breastfeeding (the first 1000 days of life) is associated with stunting. Stunting children can be ascertained by physical growth performance through anthropometry [3]. The measurements are observed based on several variables: age (U); body weight (BB); height/body length (TB); head circumference, arm circumference (LiLA) and leg length. These variables will be presented in three anthropometric indicators, namely body weight for age (BB/U), height for age (TB/U) and body weight for height (BB/TB). Toddlers are stunted with a height-for-age Z-score (HAZ) below -2 [4].

Early detection of stunting toddlers is important through monitoring the nutritional status at Integrated Service Posts (Posyandu) as the main guard of infant and toddler health services. The nutritional status can be monitored through Kartu Menuju Sehat (KMS) manually, moreover the data storage is very
vulnerable to loss and damage. So that, nutritional status monitoring using mobile application with an anthropometric approach become a promising approach to solve this problem. Application will be developed using the Waterfall model, which emphasizes the development of systematic and sequential information systems [5].

Several applications related nutritional status monitoring has been designed, such as monitoring nutritional status using web-based application [6], determining nutritional status of toddlers based on web [7], NUSA application to assess the nutritional status of toddlers based on desktop [8], a nutrition doctor-based mobile application Android [9], and so on. However, those applications were difficult to access by parents.

Design and implementation of nutrition monitoring “Nutrimo” application based on Android system are necessary to develop for parents. This application is easy to use and able to determine nutritional status of children moreover provide some advices regarding nutrition recommendations based on children’s nutritional status. It is hoped that Nutrimo may help to prevent stunting.

2. Materials and Methods

The research method applied in developing this application is the Waterfall method (Figure 1). The Waterfall method is a systematic and sequential model of information system development [5].

![Figure 1. Waterfall methods.](image)

In building and developing applications using the Waterfall method, the information system development method used is systematic and sequential, meaning that each stage in this method is carried out sequentially and continuously. Generally, waterfall method is consisted of analysis, design, coding and testing.

2.1. Analysis

This stage is an analysis of problems in monitoring and preventing stunting. Analysis was carried out to record problems that often occur during nutritional status monitoring processes in field. Nutritional status regarding height and weight was recorded manually using KMS and cannot be accessed immediately because manual data processing takes time. From the identified problems, it is necessary to develop mobile application that can provide nutritional status of children that is easily accessible.

2.2. Design

This stage is an application design with the necessary database and interfaces on Android. This process was carried out based on analysis results. There are four main menus: children information, KMS graph, news and recipes. To access those menus, user can push desired menu on their Android screen.
2.3. Coding

This stage is used Android Software Development Kit (SDK) and also Java Development Kit. Java Integrated Development Environment (Java IDE) is used to write Android code (coding). Eclipse is one of Java IDE make coding processes easier. After that, an Android emulator is required for program testing before the application is executed on actual Android devices.

2.4. Testing

Testing is carried out to determine informative rate and of the application. Respondents were tested installed application to display the nutritional status and nutritional recommendation based on the nutritional status result.

3. Result and Discussion

The minimum specifications of smartphone to run Nutrimo properly and smoothly are as follows:

- OS: Android OS, v.4.1.1 (Jelly Bean)
- RAM: 2 GB
- Processor: Quad-core 1.6 GHz Cortex-A9
- Camera: 8 MP
- Space Storage: 15.7 MB
- Screen Resolution: 720x1280-2560x1600

Flow map diagram of the current system shown in Figure 2. Firstly, parents of babies and toddlers as patients registered at administration section of Posyandu to get queue number. Administration section checked and recorded patient’s data. After that, patients were directed to examination section with the midwife to check nutritional status. Nutritional status was measured by the weight and height of the patients and it was recorded in KMS manually. If there are problems with nutritional status then patients will be directed to nutrition counseling section with the nutritionist.

![Flow map diagram of current systems](image-url)
This application was run in Android operating system that made this easier to assess nutritional status using anthropometric method. Flow map diagram of the proposed systems is shown in Figure 3.

![Flow map diagram of proposed systems.](image1)

Parents of babies and toddlers as patients registered at administration section of Posyandu. Posyandu staff signed up the patients in the Nutrimo Application if the patients did not register yet. Moreover, Posyandu staff signed in to input patient’s data if the patients had registered. After that, the data was diagnosed and displayed in form of nutritional status equipped with the recommendations based on patient’s nutritional status.

The log in menu display after Nutrimo application was run depicted in Figure 4. The main menu was divided into 2 menus for parents and Posyandu staff (Figure 5).

![Log in menu.](image2)
Main menu of Posyandu staff was divided into 5 menus: register menu, monitoring menu, user data menu, input recipes menu and input notification menu. Main menu of parents was divided into 4 menus: children information menu, KMS charts menu, news menu and recipes menu. Posyandu staff might register patients due to register menu, and then input children’s weight and height in monitoring menu (Figure 6). User data menu provided all patients data. Posyandu staff inputted notification of Posyandu activities and recommendation recipes for patient’s nutrition. Parents might see their children’s information in information menu and children’s nutritional status in KMS charts (Figure 7). News menu provided information about Posyandu activities. Recipes menu provided recommendation menu based on patients’s nutritional status.

Figure 5. Main menu: (a) as Posyandu staff, (b) as parents.

Figure 6. Register menu and monitoring menu.
Testing was applied to the respondents for measuring informative rate and usability of the application using questionnaire. The test was carried out using Nutrimo application on smartphone. Total respondents were 20 females and selected using random sampling. Respondents were consisted of 6 Posyandu staffs and 12 parents aged between 25-45 years. Figure 8 showed response of 20 respondents that obtain above 80%. It can be concluded that Nutrimo application are easy to use and informative.

4. Conclusion
Application has been completely designed for Android platform. Based on the result of testing to 20 respondents overall Nutrimo application get score above 80%, so it can be concluded that Nutrimo application are easy to use and informative.

5. References
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