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The Implementation of Smart Application System for Early Detection of Stunting as a Solution to Nutritional Problems Based on Anthropometry Standards

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Abstract: Stunting is a nutritional status determined by the PB/U or TB/U index. These measurements fall within the threshold (Z-Score) <-2 SD to -3 SD (short/stunted) and <-3 SD (highly short). Per the 2024 target established by the president, the frequency of stunting can be reduced to 14%. It has been demonstrated that there are still dietary disorders, particularly in the vulnerable age group, namely toddlers in Kemuning Lor Village. In 2018, there were still 33 toddlers with nutritional status disorders, including 24 toddlers (19.7%) with overnutrition, 5 toddlers (4.1%) with undernutrition, and 4 toddlers (3.2%) with malnutrition. Smart Systems is a subfield of Computer Science that focuses on developing competent methods inspired by natural events to address various complicated problems in the real world, including the health realm; early detection of stunting. This study aimed to develop an early detection method for nutritional status and stunting based on anthropometric standards in toddlers in Kemuning Lor Village, which is anticipated to aid cadres or the community in overcoming nutritional status and stunting in toddlers.

Keywords: early detection system, nutritional status, smart system, stunting

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1. Introduction

The prevalence of stunting among toddlers under five in Indonesia remains high at 29.6%, exceeding the WHO standard, which is less than 20%. Monitoring stunting in toddlers in the East Java region revealed undernutrition rates of 15.5%, stunting rates of 26.7%, and underweight rates of 6.9%. In Jember region, there are incredibly high rates of malnutrition (16.8%), stunting (30.9%), and wasting (8.8%) [1][2]. The group of toddlers with a low dietary status in Kemuning Lor Village consisted of 421 toddlers; 1 had inadequate nutrition, and 21 were undernourished.

This is under the research by Muflihatin et al., which demonstrated that there were still 33 toddlers with malnutrition, which 24 toddlers (19.7%) experiencing overnutrition, 5 toddlers (4.1%) experiencing undernutrition and 4 toddlers (3.2%) experiencing malnutrition, indicating a Double Burden of Malnutrition [3][4][5]. This condition causes an increase in morbidity in the short term. Simultaneously, the long-term effect is a decrease in the intelligence, creativity, and productivity of future generations of human resources [6][7].

Smart System is a part of artificial intelligence in computer science, which is highly useful in dealing with Nutrition Problems in Toddlers Based on Anthropometric Standards [8][9]. To address the stunting issue in this study, the research team developed a stunting detection system, namely an intelligent system for early stunt detection[10].

Using anthropometric standards to determine nutritional status and stunting under Regulation of the Ministry of Health of the Republic of Indonesia No. 2 of 2020 [1][11].

2. Materials and Methods

The technique introduced by Sanders [12] was employed as a research method in Developing the Smart System for Early Detection of Stunting as a Solution of Nutritional Problems in Toddlers Based on Anthropometric Standards.

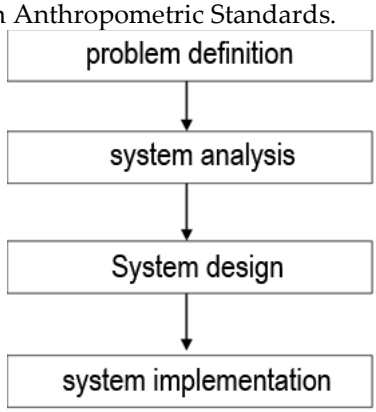

Figure 1. Sanders Methods

2.1. Problem Definition

This is the primary stage in developing the Smart System for Early Detection of Stunting to solve nutritional problems in toddlers based on anthropometric standards. Collecting written data or witnessing existing environmental concerns was performed at the problem definition stage. Data regarding the definition of the problem can be obtained through previous research or Basic Health Research data compiled or written by the Indonesian Ministry of Health[13].

2.2. System analysis

System requirements analysis was performed to determine what the system requires by gathering data related to developing the Smart Early Detection of Stunting System to solve nutritional problems in toddlers based on Anthropometric standards. Data on Nutrition Problems in Toddlers Based on Anthropometric Standards might be used to analyse necessities.

2.3. System Design

This stage is the stage of planning and making sketches in the Making of Smart System Early Detection of Stunting as a Solution of Nutritional Problems in Toddlers Based on Anthropometric Standards. System Flowcharts, Contexts Diagrams (CD), Data Flow Diagrams (DFD), Entity Relationship Diagrams (ERD), and System Layouts are the designs created. This stage's software employed Visio 2019 and SmartDraw 2013.

2.4. System Implementation

Furthermore, the programme is created in the implementation stage by transforming the outcomes of the previous system design stage's analysis. Regarding system implementation, the android studio was used for coding (scripting).

3. Results and Discussion

3.1. Problem definition

The analysis of the research situation revealed that the village of Kemuning Lor faced several issues, including 1). The ability of Integrated Service Post (Posyandu) cadres to carry out their responsibilities in providing services at Posyandu must be enhanced, particularly in terms of counselling on nutritional status and stunting (table 4 Posyandu, 2). Posyandu cadres have never been trained in early detection techniques for detecting toddlers' health conditions and stunting, 3). The inefficient use of technology in detecting

nutritional status and stunting[14]. Therefore, activities are vital to enhancing the capacity of Posyandu cadres. Through empowerment activities for posyandu cadres, it is expected that cadres will be able to assist cadres in providing the Posyandu services listed[15] in Table 4, namely providing counselling and detecting stunting and android-based nutritional status, to reduce the prevalence of stunting in Kemuning Lor Village. Since even a single toddler experiencing stunting must be addressed and managed quickly and precisely. Improving the nutritional status of Kemuning Lor population is anticipated to have a positive effect, notably the prevention of stunting.

3.2. System Analysis

Based on the findings of the analysis of the requirement of the Kemuning or Village system as follows:

a. Functional requirements:

1) provide login facility
2) provide information related to stunting status
3) provide nutritional assessment calculations
4) provide a stunting case assessment report

b. Non-functional requirements:

1) Android smartphones
2) Internet connection

*3.3. **System Design***

a. *System Flowchart*

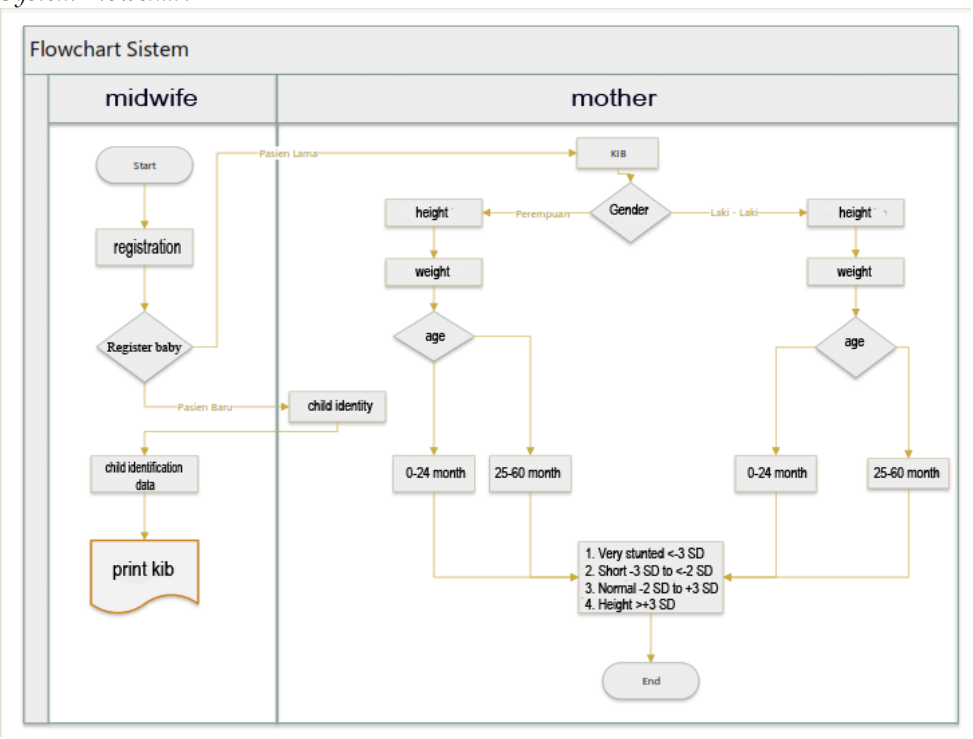

Figure 2. System Flowchart

b. *Context Diagram*

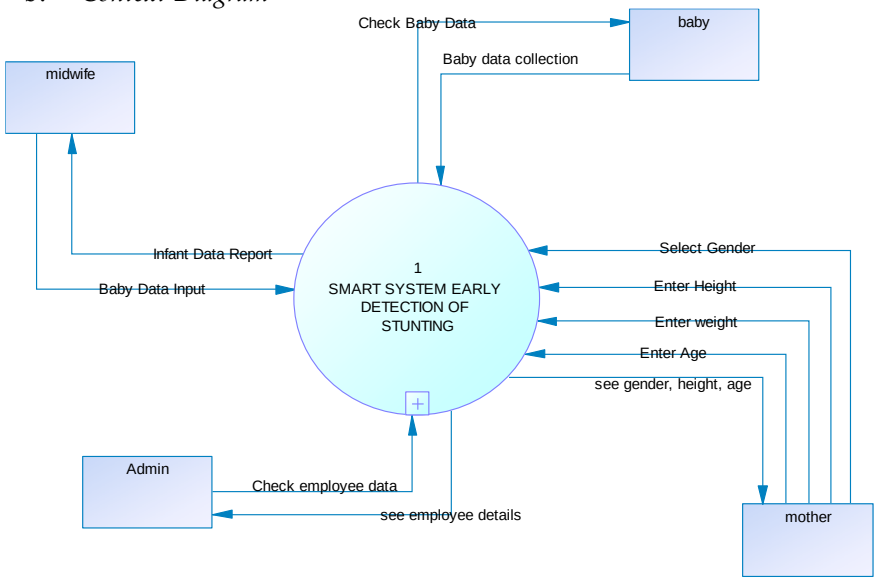

Figure 3. Context Diagram

c. Data Flow Diagram

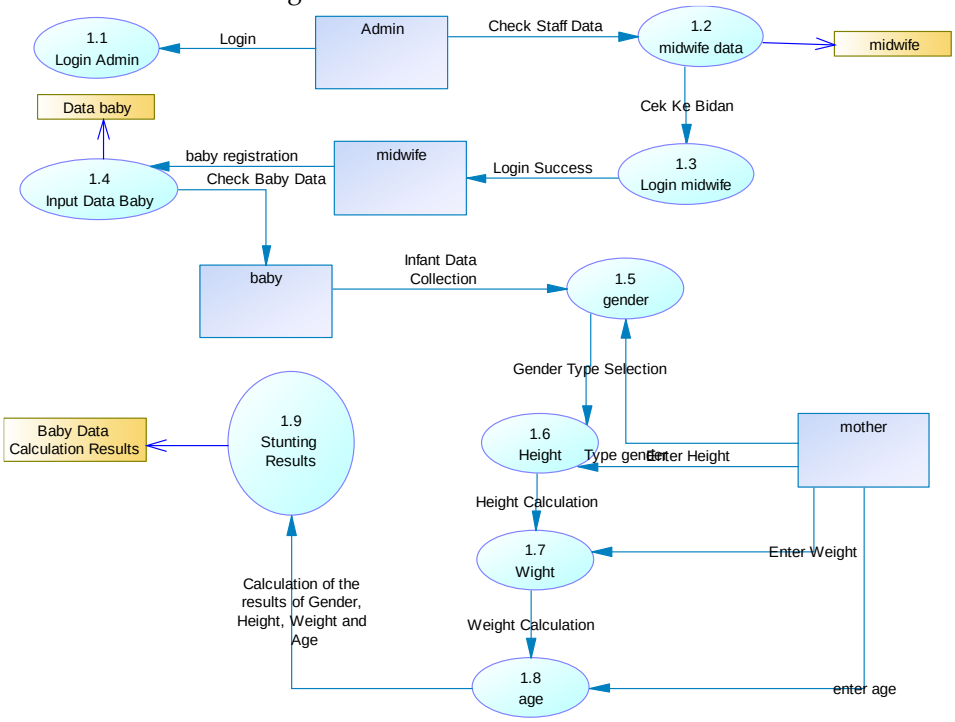

Figure 4. Data Flow Diagram

3.3. System Implementation

The Early Detection of Stunting (EDOS) application is an application that provides toddler Anthropometry calculations simpler for users.

a. EDOS application start interface

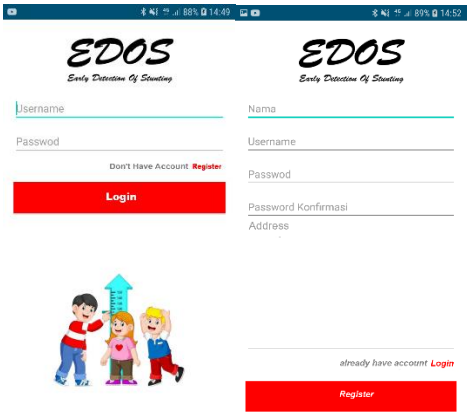

Figure 5. EDOS application start interface

When the application is first accessed, it displays a login user who can log in using the username and password of the registered account. The display on the left is when the user does not have a user account and reports one in the EDOS application. After completing a statement, the user is returned to the login screen to log in before proceeding to the following Menu.

b. Home Menu Interface

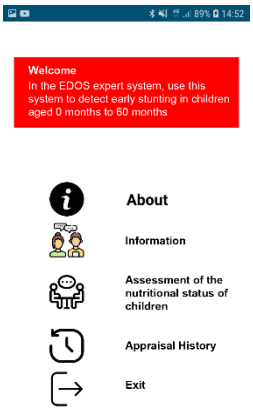

Figure 6. Home Menu Interface

The user can view numerous options in the home menu to select the actions performed by the user in the EDOS application. Welcome Information is displayed at the top, and the user has successfully logged in to the EDOS application. The Menu in this application is found at the bottom, in the order from top to bottom sequentially as follows::

1) About Menu

2) Information Menu

3) Menu for Assessment of Children's Nutritional Status

4) Rating History Menu

5) Exit Menu Tampilan Menu About

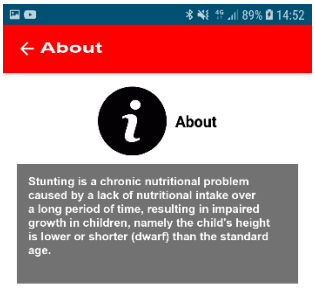

Figure 7. About Menu Interface

This menu provides the user with information regarding the operation of the EDOS application.

c. Information Menu Interface

Figure 8. Information Menu Interface

The user will discover Information regarding the causes of stunting in toddlers under the contents menu. Before utilising the EDOS application, the user must understand how to edit toddlers and perform stunting calculations.

d. Menu Display of Children's Nutritional Status Assessment

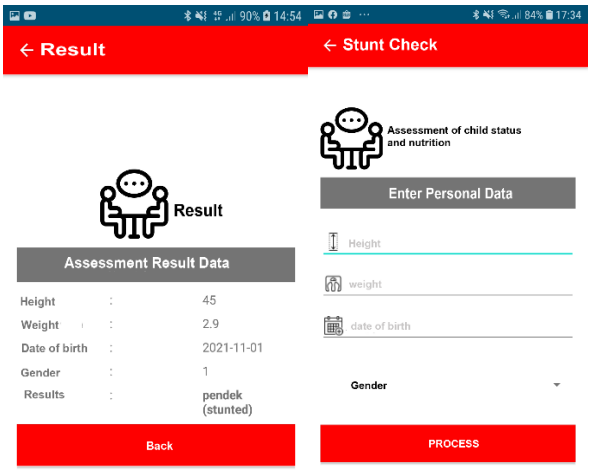

Figure 9. Menu Display of Children's Nutritional Status Assessment

The user will compute stunting in toddlers in this Menu. The first step requires the user to enter the toddler's height or length. The user must join the toddler's weight, then the toddler's date of birth,

and finally the toddler's gender because the computation of the toddler's gender influences the study of stunting in toddlers. The calculation results the user has entered are shown in the left view; the calculation is under the Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2020 about toddler Anthropometry Standards.

e. Rating History Menu Interface

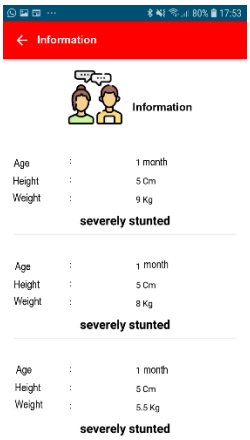

Figure 10. Rating History Menu Interface

This Menu displays the findings of the previous assessment and the results of the subsequent analysis, allowing the user to determine if the toddler is still stunted or has stunted.

f. Exit Menu

This menu is useful for exiting the EDOS application and logging off.

4. Conclusions

The problem is insufficient cadre knowledge; cadres have never received training or used technology daily, There are two system analyses, namely functional requirements, consisting of login facilities, information related to stunting status information, nutritional assessment computation, and stunting case assessment reports. Non-functional requirements consist of an Android smartphone and an internet connection. System design contains a system flowchart, context diagram, and data flow diagram with the following four entities: administrator, midwife, infant, and mother. The implementation of the system includes a login menu, home menu, information menu, toddler nutritional status assessment menu, assessment history menu and exit menu.

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