Design of Information System Immunized Care Services Based on Mobile
(Case Study : Puskesmas Maos Cilacap)

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Abstract--- **Immunization is toddler disease prevention program. Immunization in toddler expects each toddler to receive five types of basic immunization. Toddler health must be well-guided so that they can know the process of growth and inhibition of toddler growth from an early age. Maos Health Center is one of the health centers located in Cilacap. At present the administration system for child health services for toddler immunization programs is still done conventionally (paper based) which can lead to several problems, including: if the check up card is damaged / lost the toddler medical history cannot be known and is difficult to trace, the immunization schedule at each stage is not can be ascertained by the mother (lost control), the toddler track record of growth cannot be known at any time, if growth is not good in accordance with the normal limits of growth of children in general, then consultation with a doctor must be done directly and of course it takes time and cost.As an alternative to overcome existing problems, it is necessary to develop an information system care service on Mobile Based. Based on the results of research that has been carried out by the system testing, 64% of respondents stated strongly agree that with the existence of information systems, the management of the administration of toddler immunization can be more organized, the toddler immunization schedule is more controlled, the normal growth limit of toddlers can be known through E-KMS, consultation between mothers and doctors can be done online so that it can save time and money, mothers can monitor the track record of the growth of her toddler at any time by using a computer (web based) or using a smartphone (mobile based).**

Keywords: Mobile based informationsystem; immunization services;growthtoddler.

I. INTRODUCTION

Information Technology has provided an important role as a medium of information and communication to support business processes in the fields of industry, government, education and health. Even by paying attention to the demands of information needs that are faster and more precise, encouraging information technology to be developed based on mobile. It is also supported by the participation of the community which currently has the majority of smartphone communication devices.

One area of health that must be supported by information technology is public health services. The purpose of health services is to meet the needs of individuals or communities to overcome, neutralize or normalize all problems or all irregularities about health in society[1]. One example of the field of public health services in toddler immunization programs.

immunization is a prevention program for toddlers. Immunization in toddler hopes that each infant will get the five types of complete basic immunization. The success of a infant in getting 5 types of basic immunization is measured through a complete basic immunization indicator [2]. Therefore, the health of toddler must be monitored and monitored properly so as not to delay the prevention of disease through immunization programs. Monitoring of toddler growth is very important to be done to determine the obstacles to early growth. Toddler growth can be known from weighing every month is very necessary. Growth monitoring is currently a posyandu activity which amounts to more than 260,000 spread throughout Indonesia.

Maos Health Center is one of the health centers located in Cilacap Regency. Currently the administration system for child health services, especially in the toddler immunization program at the puskesmas is still carried out conventionally. It can be said conventionally because the management of health service administration through a toddler immunization program is still done by recording in the master book and check-up card as a medical history document (medical record) of toddlers. In addition, every mother under five must keep a Health Towards Card (KMS) well so that it is not easily damaged or lost and uses it as a guideline for her infant's immunization.

Based on the results of interviews and observations this method still leaves some problems, including: [1])Check-up cards are easily damaged or even lost which results in the toddler's medical history can not be known anymore and difficult to trace again, [2])If the check card is lost, then the toddler cannot know lost control when the infant is immunized at every step, [3])the track record of the infant's growth can not be known at any time, [4])If the growth and development of the child is not good / not in accordance with the normal limit of toddler growth and development in general, then consultation with a doctor must be done directly and it certainly requires time and cost. Unlike the case if there is an information media that can accommodate consultation between mothers and doctors.

Based on the existing problems, it is very necessary for an Information System that can specifically manage the toddler immunization program at the Maos Lor Cilacap Health Center. For that reason, as an alternative to solve the existing problems, the researcher took the theme "Design of

Information Systems for Mobile-Based Toddler Immunization Services for Case Study of Puskesmas Maos Lor Cilacap". With this system, it is expected that the management of toddler immunization administration can be more organized and effective, the toddler's immunization schedule is more controlled, the normal limits of toddler growth can be known through E-KMS, consultation between mothers and doctors can be done online so that it can save time and costs. In addition, each mother can monitor the track record of her infant's growth and development at all times by using a computer (web based) or using a smartphone (mobile based).

II. LITERATURE REVIEW

A. Related Research

Related research on the development of electronic applications (information systems) under five immunization services has been carried out by several previous researchers.

Research related to the title of Mobile Application Towards Healthy Cards (E-KMS). In this study, researchers produced an M-KMS application to record the results of measurements of toddlers' weight and height, notes on the development of toddlers immunization. An application developed based on Android for parents of toddlers to be able to see the normal limits of toddler growth which later can be compared to the health of their children. The application developed only presents KMS in Android-based electrons. Application development is done using the C # language and Xamarin framework. The results of this study are an application storing a toddler's health history on an Android-based mobile device. The application is made using visual basic programming language and is a stand alone application, which is only accessible from the computer where the application is installed. The advice given by respondents in the application is the addition of a toddler weight chart. This application received a positive response from posyandu cadres, where most of them argued that E-KMS could reduce errors in calculating the age of toddlers, and cadres could immediately see the history of immunization and vitamin A. This application can only be accessed by posyandu cadres who have computers to access the application, so that the toddler's health history data cannot be accessed at any time by the toddler's mother[3].

Other research related to the title of Posyandu Application Simulation Based on the Concept of RFID (Radio Frequenty Identification). In this study, researchers used RFID (Radio Frequency Identification) which functions as a unique identity for each user and stores data and user activities at the posyandu. This application is only applied to each posyandu and has not been integrated with each other. This application is also only accessed by posyandu cadres so that the toddler's health history data cannot be accessed at any time by the toddler's mother[4].

Other research related to the title Effectiveness of the Use of Electronic Towards Healthy Cards (KMS) to Improve Service Speed, Facilitate Data Collection and Decision Making of Health Status in Posyandu. In this study, researchers developed a program in the form of Electronic Towards Card (KMS) Electronics, then conducted a trial to respondents. Respondents are cadre mothers and mothers who have toddlers who are in Cemara III posyandu on Jl. Ngagel Tirto III. The results of the study from the study that,

monitoring the child's growth can be done in many ways, one of which is by looking at changes in body weight (BB). Change in body weight (BB) is one indicator that can be said to be sensitive enough to monitor children's growth and development. One way to monitor the weight gain (BB) of a child is to look at the Health Towards Card (KMS). The conclusion that can be drawn by the respondents argues that E-KMS is better than manual KMS and is preferred over manual KMS. E-KMS needs to be equipped with graphics and if possible use other indicators[5].

In contrast to other studies that have been conducted. In this study, researchers will develop an Information System for Mobile-Based Toddler Immunization Services Case Study of the Maos Lor Cilacap Health Center. Applications are developed based on web and mobile, so users (health center staff, doctors, and mothers of toddlers) can access the system online by using a computer or using a mobile phone that can be accessed at any time. The system developed can manage the administration of toddler immunization which consists of recording toddler data, toddler health history (medical record) which can be displayed in the form of data and graphics. In addition, the system that will be developed can function as an online communication medium between doctors and mothers of toddlers, so that it can provide easy access for mothers of toddlers and be more effective and efficient in consultation. What is meant is effective in terms of technical consultation, while the efficient ones are in terms of time and cost (time reduse and cost reduce).

B. Basic Theory

Immunization

Puskesmas is one of the government agencies that plays an important role in the delivery of health services to the community, in which puskesmas are required to improve the quality of performance in providing services to the community[6]. One of the services to the community is the service of a toddler immunization program. Immunization is a disease prevention. Immunization in infants hopes that each baby will get the five types of complete basic immunization. The success of a baby in getting 5 types of basic immunization is measured through a complete basic immunization indicator[2]. After the child is immunized, it means being given immunity to a particular disease, therefore immunization must be given in full[7].

E-KMS

Community participation is certainly very important to be able to reduce the incidence of malnutrition in infants. High awareness is needed from each family to maintain the health of family members. Mothers play an important role in this regard, considering that you are the primary educator and caregiver for their children. One simple thing that is often overlooked by mothers and health cadres is the Health Towards Card (KMS). The Posyandu monitors children's growth and development through weight charts and records them on E-KMS (Check up card elektronic). E-KMS is a card that contains the child's normal growth curve based on the anthropometric index of body weight according to age which can be accessed by internet[8]. KMS also functions as a nutritional extension tool for mothers who have toddler[3].

Immunization Services Information Systems on Mobile based

Immunization Services Information Systems on Mobile based can be defined as a computer on mobile-based information system that can be used to manage the administration of immunization programs and provide information on toddler health services so that growth can be monitored properly. The information system can be accessed by the user by using kemputer (web based) or using a smartphone (mobile based).

III. RESEARCH METHODS

The study was carried out in several stages, namely: Viewing and analyzing the management of existing under-five immunization programs (existing conditions), mapping existing processes, searching for ongoing administrative process problems, finding sources of problems, and designing and developing a system which can be developed to reduce or eliminate existing problems.

The following are research materials, research tools, and research path "Design of Information Systems for Mobile Immunization Services for Toddler Case Study of Puskesmas Maos Cilacap".

A. Research Materials

In this study, the research materials used are as follows:
1) Data obtained from analyst studies that have been conducted at the Maos Lor Subdistrict Health Center both through interviews and observations.
2) Data obtained from a literature study on Mobile Based Information Systems
3) The process of administering the immunization program running
4) Information about the development of an existing mobile-based Information System.

B. Research Tool

The research tool used in this study is a computer device that has sufficient specifications, mobile devices (smartphones), developer software, and graphic design software.

C. Research Path

In the process of developing a Mobile Based Immunization Service Information System for the Case Study of the Maos Lor Cilacap Health Center, the researcher refers to the general software development method, namely the System Development Life Cycle (SDLC) development method. This method serves to develop, maintain and use a system that includes a number of phases or stages as shown in Fig 1.
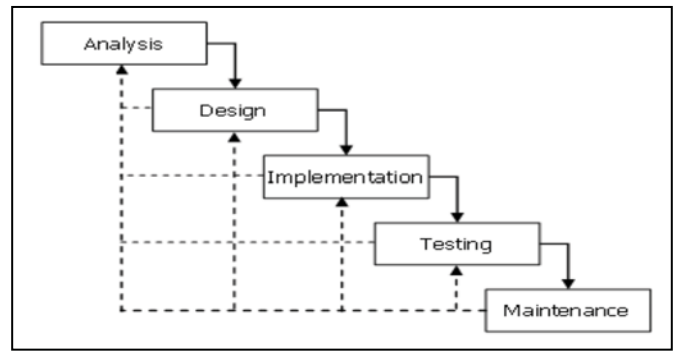

Fig.1 Waterfall Model [9]

SDLC development method consists of several phases or stages. The method will be used in the development of the system "Design of Information Systems for Mobile-Based Toddler Immunization Services Case Study of the Puskesmas Maos Lor Cilacap".
1) Planing Stage
   a. Feasibility is identifying problems, determining system objectives, and making feasibility studies (techniques, operations and schedules).
   b. The investigation system and observations and interviews.
2) Analysis & Requirement PhaseIn the planing stage there are two steps, namely:
   a. Information analysis is about the information from the Maos Lor Cilacap Health Center and the management process of the under-five immunization administration that has been running.
   b. User analysis is to determine user needs, in the sense of identifying users who will use the system.
   c. Technology analysis is to determine the system needs of both software and hardware.
3) Design Stage
At the design stage there are several stages, including:
   a. Development model is a model that will be used as a system architecture. This model describes the relationship (relationship) of the whole system, between all functions in a separate module, changes or transfer of data from modules in the system.
   b. Database design is the relation between tables can be normalized, and describe in detail the input and output of data.
4) Implementation Phase
The results of the implementation are prototyping software. Prototype is tested and refined before the software is implemented or used. In software engineering, prototyping is a production process.
D. System Desaign
System design is carried out by estimating the immunization processes of children under five which are described in the form of activity diagrams and Data Flow Diagrams (DFD). The process of toddler immunization is carried out as shown in Fig 2.
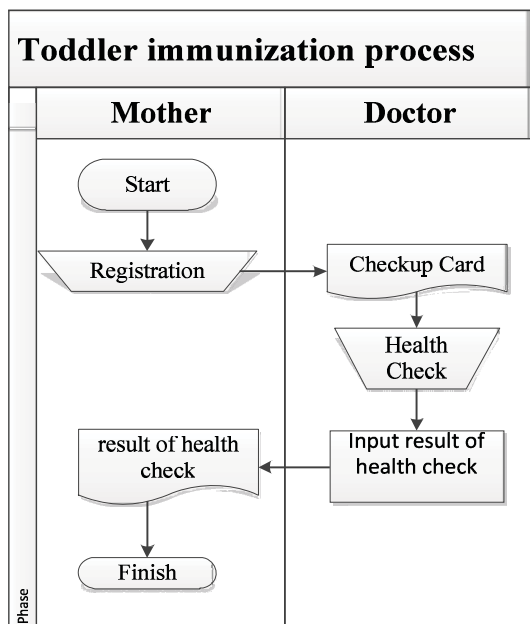
Fig.2. process of toddler immunization

Fig. 2, describes the process of toddler immunization which consists of several stages, including:

1) The initial process is started by a mother who registers her child for a health check (immunization) and the child's data will be stored in the system

2) The next stage a doctor will check the toddler's health condition and the results of the examination will be stored in the system. The results of the examination were also given to the mother of the toddler to find out the condition of her son.

In a developed system, a mother can see her son's medical history through a computer or mobile device (smartphone) accessed online. Thus, a mother no longer needs to seek information about her son's medical history through a check card. In addition, a mother can also monitor her son's growth periodically through the E-KMS feature. The monitornic process of the toddler's health history is shown in Fig 3.
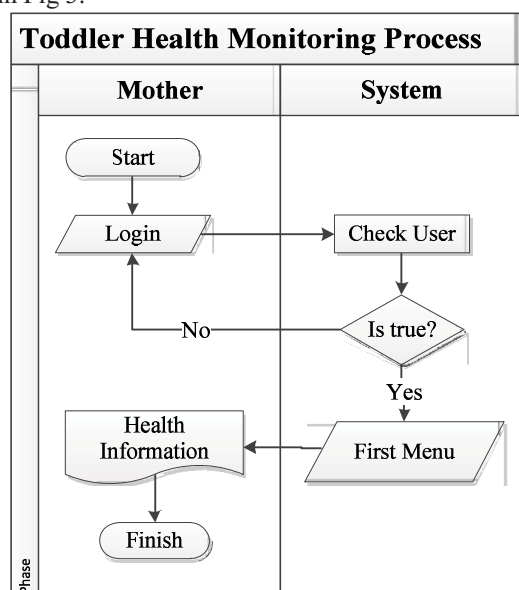

Fig 3. Process of Monitoring Toddler Health

Fig.3, shows the process of monitoring the health of children under five carried out by his mother. This monitorng

process serves to determine the progress of his son's development gradually. To be able to see the health information of his son, a mother must first login the system through a computer or mobile device (smartphone) online. After logging in, you will see the health information of each son.The developed information system network topology is shown in Fig.4.

Fig.4. Network topology of information system[10]

Fig.4, shows the information system network topology that will be developed. Users can access the system via a computer or mobile phone.

To illustrate the processes that are running on the system being developed, a system design is created in the form of Context Diagrams and Data Flow Diagrams (DFD). There are three actors who use the system, among others, administrators, doctors, and mothers of toddlers. The context diagram created is shown in Fig.5.
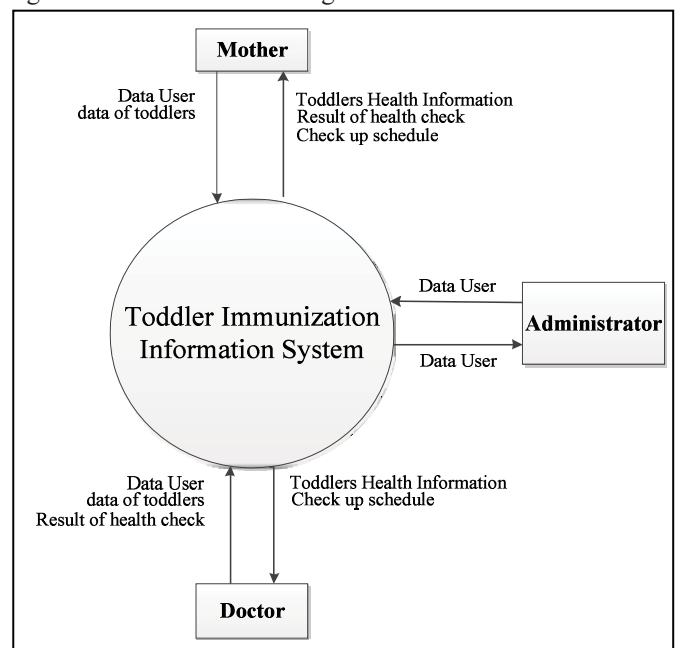

Fig.5. Context Diagram

Fig.5, shows a context diagram of the information system developed. The process that runs in the context diagram can be explained as follows:

1) The administrator is responsible for managing user data.

2) Doctors input data on the results of toddler health checks. In addition, doctors can also see information on toddler health history.

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3) Mother can see information about her son's medical history and can see information on his son's growth and development gradually.

After creating context diagrams, then to explain the main processes developed in the system, a design is made in the form of Data Flow Diagrams (DFD) level zero shown in Fig.6.
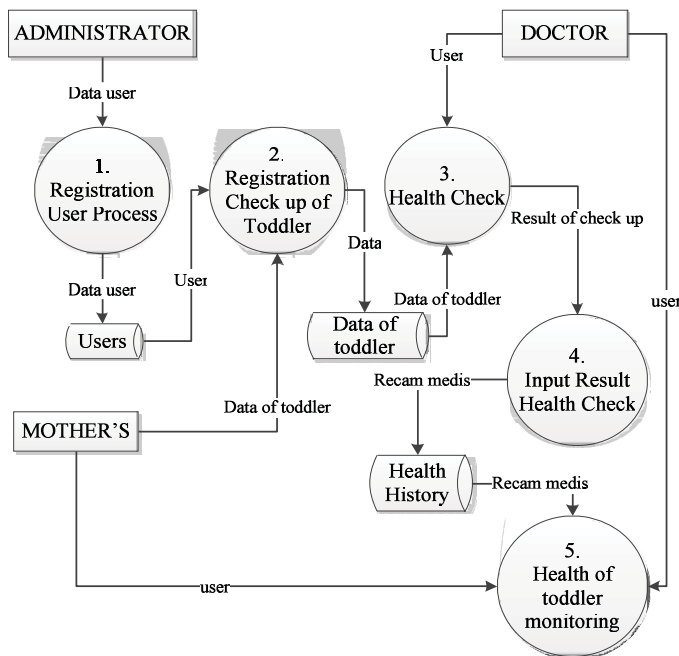

Fig.6. Data Flow Diagram (DFD) Level Zero

IV. RESULT AND DISCUSSION

The results of the research that have been carried out are the creation of a mobile-based Toddler Immunization Service Information System. The main function of the system being developed is to collect data on the results of toddler health checks and monitor growth and development of the child's health history at each stage through e-KMS.

A. Manajement of toddler Immunization

In managing toddlers' data in the immunization program, the first step taken is to input the toddler's data when first immunized. This data is a database of toddler immunization services in the Maos Lor Health Center.

After the toddler data input process, the next stage is the process of immunization of children under five carried out by a doctor. The results of the health examination will be stored in the system as information on the child's health history that can be accessed at any time by the doctor or his parents. The results of health checks on immunization programs that have been carried out can be shown in Fig.7.
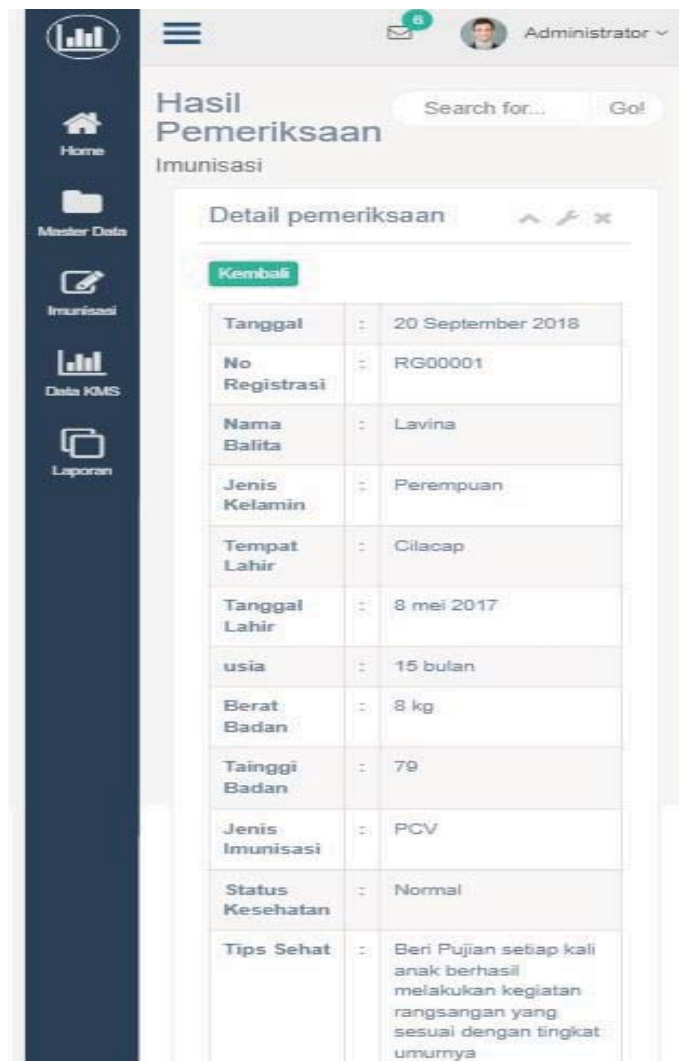

Fig.7. Result of check up

Fig.7, shows information on the results of health checks and immunizations that can be accessed by doctors or parents through a computer or mobile phone.

B. Monitoring of health and development of toddler

Monitoring toddler growth and development is one of the main functions in the system developed. Monitoring can be done by parents at any time via a computer or mobile phone. The monitoring process can be shown in Fig.8.

Fig. 8. The process of monitoring toddler growth development

Fig.8, show the process of monitoring the health of infants. When you press the check button, the display will appear as shown in Fig.9.

Fig.9. Detail of process monitoring toddler growth development

Fig. 9, shows detail of process monitoring growth and development of children who can be done by doctors or parents. To find out information about child development, the user must fill in the toddler registration number first so that toddler data can be called from the database and calculate the toddler's age automatically based on the date of birth and date of monitoring. The next stage the user fills in the weight condition. After pressing the check button, toddler health information will appear as shown in Fig. 9.

Doctors and parents can see the development of their child's growth in graphical form as shown in Fig.10.
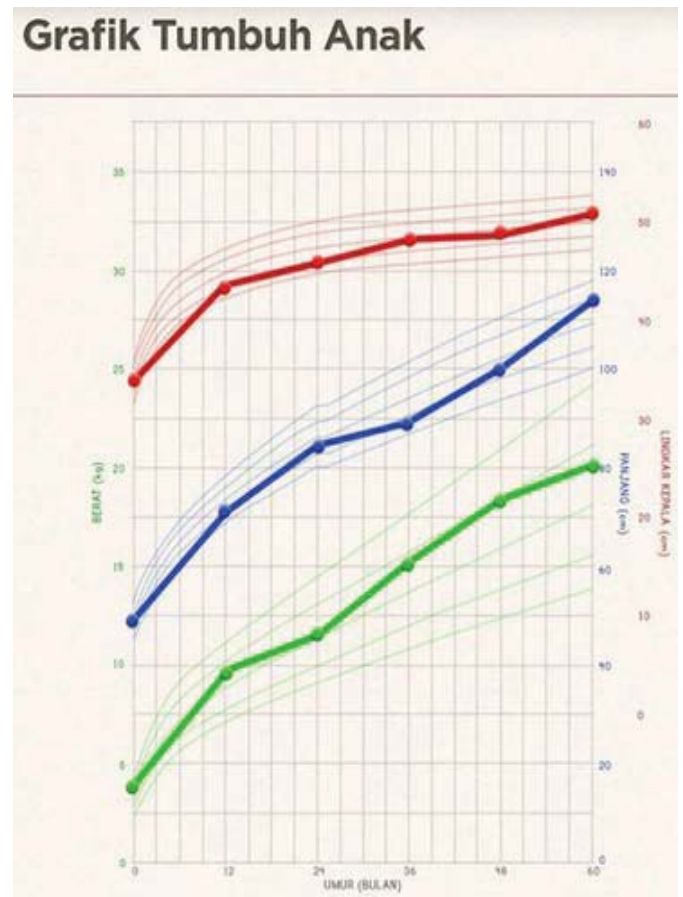

Fig. 10. Graph of toddler growth

Fig.10, shows information on growth and development of children under five who are adjusted based on age and height and weight development.

C. *System Testing*

System testing is done by white box testing method. Tests carried out by 10 respondents with results as shown in Table.1.

TABLE 1. SYSTEM TESTING

No.	Assessment	Test Result		
		NA	A	SA
1.	Administrative management of immunization services and toddler health medical records is more organized.	0	2	8
2.	Monitoring the development of toddlers can be done by mothers and doctors both through computers (web based) and smartphones (mobile based)	0	1	9
3.	The schedule of toddler immunization programs at each stage can be accessed online, so it can remind mothers of toddlers not to forget to immunize their children.	0	3	7
4.	Consultation and communication between a toddler and a doctor can be done online, so it can save time and money (cost reduction).	0	6	4
5.	Normal limits of toddler growth and development can be identified through E-KMS.	0	5	5
	Amount	0	17	33
	Percentage (%)	**0**	**34**	**64**

Notes :

NA = Not Agree
A = Agree
SA = Strongly Agree

Table 1 shows the results of the system testing conducted by 10 respondents. Based on the results of these tests it can be stated that in general that System Immunized Care Services Based On Mobileis very helpful in the management of the administration of toddler immunization and monitoring of toddler growth and development.

V. CONCLUSION

Based on research that has been carried out by developing Information Systems for Toddler ImmunizationServices mobile based and has been system testing with 10 responden, the result show 64% of respondents stated strongly agree that with the existence of information systems, the management of the administration of toddler immunization can be more organized, the toddler immunization schedule is more controlled, the normal growth limit of toddlers can be known through E-KMS, consultation between mothers and doctors can be done online so that it can save time and money (cost reduce), mothers can monitor the track record of the growth of her toddler at any time by using a computer (web based) or using a smartphone (mobile based).

Suggestions that can be made for the development of the system in subsequent research is the need to develop an sms gateway function to provide information to mothers of toddlers if the immunization stage has arrived so that the immunization program can be more controlled.

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