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Expert System for Pregnant Mothers Treatment and Early Disease Detection for Infants and Toddlers Based on Android (Kasih Ibu)

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Abstract. Mothers and children are family members who need priority in the context of the implementation of health services. Therefore, efforts to improve maternal and child health are of particular concern. Assessment of maternal health status and performance of health services is important to monitor (Indonesian Ministry of Health, 2014). On the other hand, complications in the health of pregnant women, infants and toddlers are still common, so more effort is needed in handling them. Based on the 2012 Indonesian Demographic and Health Survey (IDHS), the maternal mortality rate in Indonesia is still high, amount 359 / 100,000 live births. Maternal, infant and child mortality rates are still high, one of which is caused by a lack of attention to health when pregnant or improper handling when symptoms of certain diseases arise. In this study, an expert system application was built to help mothers during pregnancy, suppressing MMR (Maternal Mortality Rate,) by making mothers understand their condition and understanding various complications of pregnancy. In addition, this application can help early detect symptoms of diseases for infants and toddlers so that it can help users to prepare everything related to disease management. This application is called "KASIH IBU" and is built on a mobile basis. The mobile base was chosen because currently mobile devices have been widely used by the community, especially mothers.

1. Introduction

Pregnancy is intrauterine growth and development starting from conception to the onset of labor [3]. Duration of normal pregnancy are about 280 days (40 weeks or 9 months 7 days) which calculated from the first period [4]. Pregnancy is generally divided into quarterly or trimester periods. In each trimester, pregnant women experience typical changes, both in physical aspects such as emotions, morning sickness, cravings, alcohol, mood, insomnia, decrease, and log responsiveness.

In medical reviews, there are several things that can increase the safety risk of pregnant women, such as lack of awareness to conduct health checks during pregnancy (antenatal care).Ignorance of pregnant women and those closest to the indication of danger and nutritional factors can cause a decrease of general health status and endurance of pregnant women.

The physical and psychological quality of a child will be determined by the physical and psychological qualities of their mother during pregnancy. Such factors will affect the baby directly or indirectly. Therefore, vigilance and caution of pregnant women for maintaining her emotional health and stability are also needed during pregnancy [5]. .

Maternal health services are manifested through the provision of antenatal care at least 1 time in the first and second trimesters, and 2 times in the third trimester. These service standards are recommended to ensure protection for pregnant women and her fetus, in the form of early detection of risk factors, prevention and early detection of pregnancy complications. Antenatal services are striving to meet the 7T quality standards, as follows [1]:

1. Weighing weight and height measurement.
2. Blood pressure measurement.
3. Height peak of the uterus (fundus uterus) measurement.
4. Determining the tetanus immunization status and administration of tetanus toxoid immunization according to immunization status.
5. Giving blood supplements, minimum 90 tablets during pregnancy.
6. Providing interpersonal communication and counseling, including family planning.
7. Simple laboratory test services, minimum hemoglobin blood test (Hb) and blood type examination.

Maternal Mortality Rate (MMR) is also an important indicator of public health status. This number represents the number of women that died caused by pregnancy disorders or their treatment (not included accident during pregnancy, childbirth and the postpartum period without calculating her pregnancy duration) for each 100,000 live births. figure 1 (a) show IMR data in Indonesia from 1994 to 2018 and 2019 target.

Furthermore, after the baby is born safely, health care must be kept in mind to ensure the baby / child grows up healthy, smart and excellence, and decreases the Infant Mortality Rate (IMR). Infant mortality number is the number of people who die before reaching the age of 1 which is stated in 1,000 live births in the same year. Infants aged 0-1 years are in conditions that are vulnerable to both pain and death. Lack of knowledge of mothers about early identification of disease symptoms in infants / children can be fatal. Vice versa, an overreaction to the disease symptoms appear may also lead to improper handling.

Various factors can lead to a decrease in infant mortality number, one of that was to increase access to the health services. figure 1 (b) shows the infant mortality number data from 1991 to 2012.
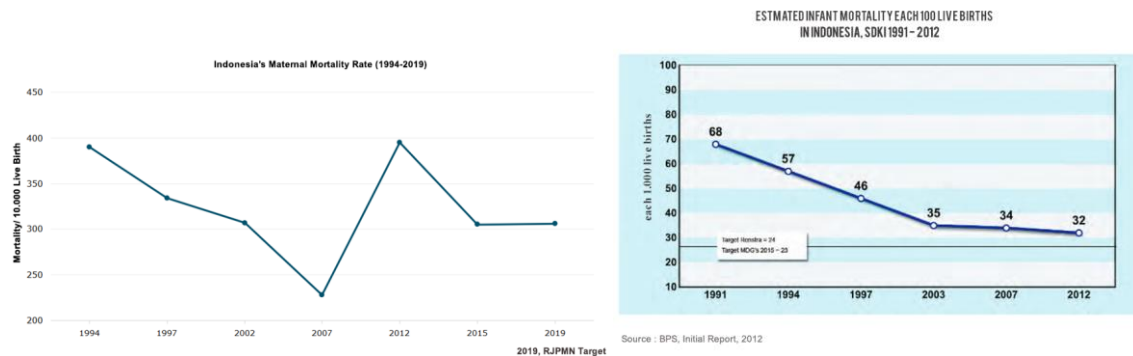
Figure 1. (a) IMR data in Indonesia from 1994 to 2018 and 2019 target, (b) Infant mortality number data from 1991 to 2012

The current sophisticated technology can guide pregnant women to deal with problems during pregnancy. Some technologies that have been used for pregnant women are: Fetal Doppler (a tool for detection heart fetal rate in the mother's womb), Ultrasonography (USG), CTG (cardiotocography), Funduscope (device for detecting fetal heart rate), and so on which is a technology that has been owned by the hospital [2].

In addition, because of the proliferation of android devices in the society, there are also a lot of applications that available to monitor the condition of maternal and fetal health.

This study offers a solution in the form of a single application that can provide information for the care of pregnant women and early detection of infant and child diseases at once, and named "KASIH IBU". In addition, this application provides E-learning function of the growth and development of infants and toddlers, information about the disease of infants and toddlers and information about the

location of midwives in Bandar Lampung. In addition, this application provides information about baby names around the world in various categories. This application is built using expert systems and mobile technology. So start with only one single android application, mothers and pregnant women get almost all the information to deal with problems during pregnancy and baby care/ child. The ultimate purpose of this application is declining MMR and IMR so that new generations grow well, healthy and smart.

2. Materials and Methods
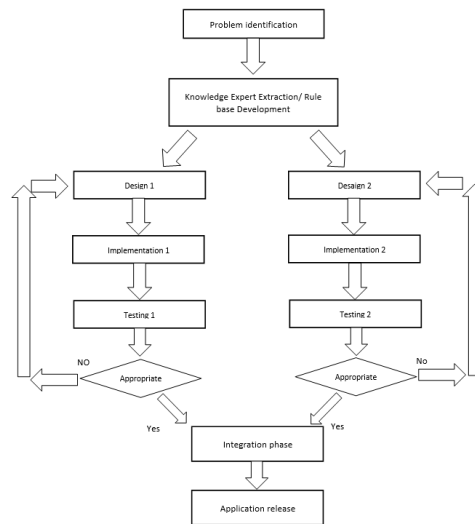
Figure 2. Research Methodology

The phase of work start by collecting data and ideas that support the process of making android-based applications. Data was collected from several related sources/ literature that support the creation of this application. This idea was obtained based on our concern in the perspective or lack of understanding and concern of a mother towards herself and their children, which aroused concern in the community so as to cause a large number of deaths to befall a mother and child. This android application can later help prospective mothers to learn things they haven't known yet.

Then, on the analysis phase, we collected literature and system requirements from the society as a source of information to be inputted into the "Kasih Ibu". "Kasih Ibu" will be completed with features needed by mothers, pregnant women, and mothers who just got children to help and prepare "strength" during pregnancy. This application also has a function for early detection of diseases that often occur in infants / children based on their symptoms.

After the analysis process was complete, we carry out the system prototype design or android based application. Our prototype phase was divided into two separate modules, such as the maternal care module and the child and toddler disease modules. We do this module sharing for system optimization and because we have two programmers. In this prototyping design stage, we designed a similar tool with a smaller capacity. As a tool for testing and we tested the system.

Once designed, each of our modules implements the rule base that we already created and continued in coding the system using the appropriate algorithm. We are using android studio application in the coding process. We made two rule bases, such as early childhood diseases and detection pregnant woman disease and we also created a matrix table to make it easier to coding.

After implementation, we tested each module unit and ensured that our rule base was already appropriate to the system requirement. After each module unit is suitable, then we will carry out the integration process, which combines the two modules so that they could become complete applications.

3. Results and Discussion

The results of the research is a mobile application that has the knowledge of an expert who is experienced in the field of maternal and child care.
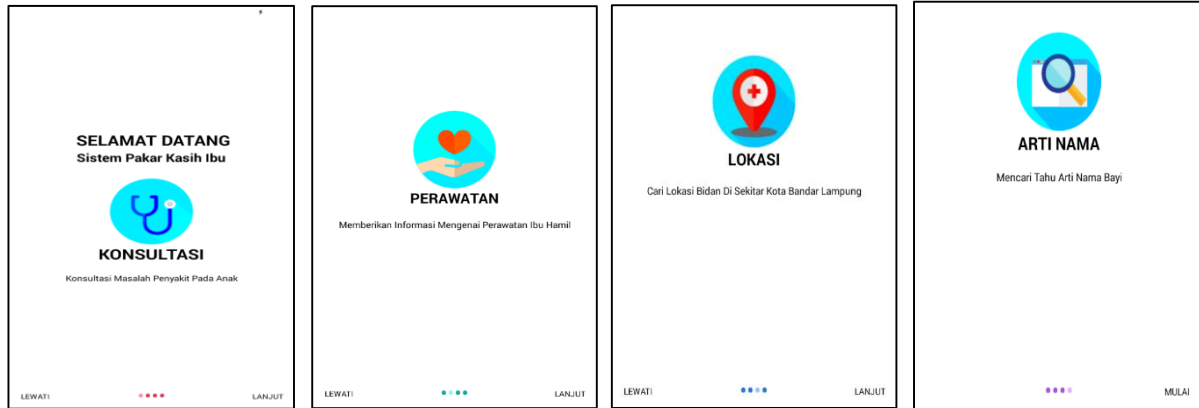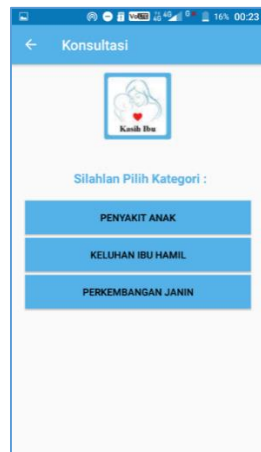

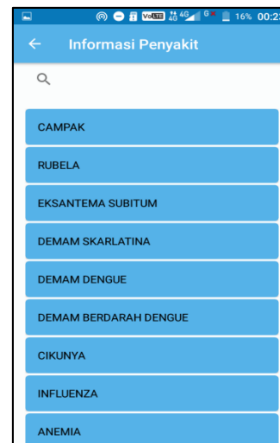**Figure 3.** Initial Application Screen on First Installation

After this application is successfully installed, a notification screen will appear, exposing the main features of the application, as seen in Figure 4.
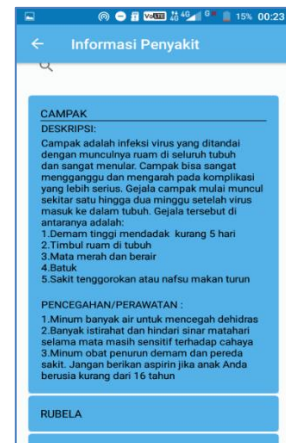

**Figure 4.** Main Menu/ Interface of the Application

Figure 5. Interface for Consultation Menu

Figure 6. Interface for Data Menu

**Figure 7.** Interface for Example Detailed Deases

The application will display the full function of each menu when the user clicks on one of the menus. Figure 5 is a display of the consultation menu for early diagnosis of childhood illnesses, complaints of pregnant women and information on care of per trimester fetuses. The Data feature providing informations about children deases and its detail (Figure 6 and Figure 7). The application provides informations about pregnancy and important tips for mothers (Figure 8).
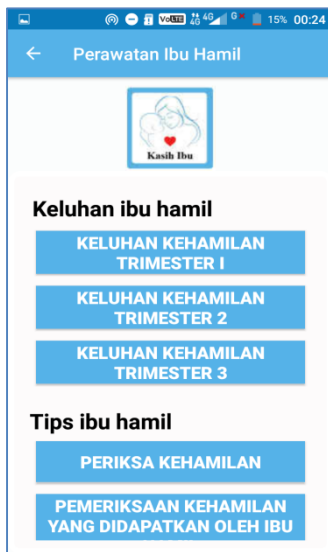
Figure 8. Interface for Maternity Care
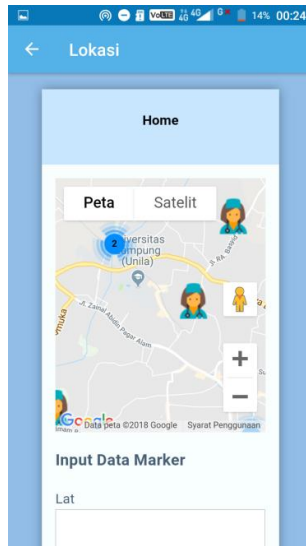
Figure 9. Maps Interface for Widwives and Hospitals Location
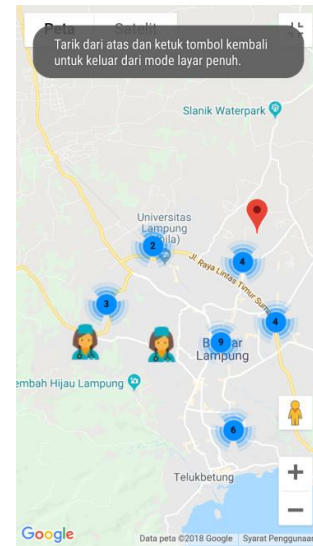
Figure 10. Interface for Searching Result on Location

Figure 11. Interface for Name Meaning

Figure 12. Help Interface

The application also provide location for midwifes and hospitals in Bandar Lampung. This feature ensures that users get immediate attention to the symptoms appear. The maps feature display as seen on Figure 9 and 10. The name meaning feature is a feature that enable user to search the meaning of a children name. There are 1100 name and its meaning that exist in this application. In this application we create help features to provide knowledge about the use of our applications that we did to make our application easier to use.

4. Conclusions

It can be concluded that this application that we called "Kasih Ibu" can educate the society, especially prospective mothers. So it can be concluded with the existence of this app could help in a lot ways, such as: (1) Provide knowledge about the treatment of pregnant women, (2) Provide knowledge about symptoms of child illness, (3) Provide knowledge about disease problems in pregnant women, tips for pregnant women, and symptoms of child illness, and (4) Provide feature for finding the location of midwives and hospitals around Bandar Lampung.

Acknowledgment

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