Design of Information System to Detect Antenatal Depression

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Abstract. Depression is a major cause of disease burden worldwide in women of childbearing age and 5-10% of all pregnant women experience antenatal depression. depression in pregnancy is associated with the incidence of stillbirth, premature, low birth weight, asphyxia, and congenital abnormalities in newborns. Although antenatal depression has a very detrimental effect, anxiety and depression during pregnancy are still less detected so that the treatment has not been maximized. The aim of this study is to develop model of antenatal depression detection system. This research will design an information system on detection of antenatal depression based on Android mobile using prototyping method. The needs analysis of this information systems is carried out by interviews, observations, and literature studies aimed at producing an effective and efficient system. Antenatal depression detection test uses the Edinburgh Postnatal Depression Scale (EPDS) questionnaire consisting of 10 questions. The results of this study is the form of antenatal depression detection information system design in android and web based.

Keywords : information system, antenatal depression, pregnancy

1. Introduction

Not only being an exciting and joyous period, pregnancy can also be a hard and stressful period due to the physical and psychosocial changes experienced by pregnant women. Therefore, pregnancy increases the risk of mental health disorders in pregnant women [1]. Unstable emotional state can increase stress in some pregnant women. The response to stress experienced by pregnant woman also varies, it can be clearly seen or not [2].

Depression is a major cause of disease burden worldwide in women of childbearing age and 5-10% of all pregnant women experience antenatal depression [3]. Depression in general is more common in women (5.1%) than in men (3.6%) [4]. In a study conducted by Mak et al., (2019), it was found that the prevalence of antenatal depression was 17.5% of 1440 pregnant women in China. Another study found that during pregnancy, the incidence of antenatal depression mostly occurs at 12-16 weeks' gestation with a prevalence of 5.2%, at 22-26 weeks' gestation at 2.6% and at 32-36 weeks' gestation at 3.5% [5]. The symptoms of antenatal depression are associated with low bio-psycho-social-cognitive in newborns until the neonatal period. Depression in pregnancy affects the fetus through hyperactivation of the maternal hypothalamus-pituitary-adrenal axis and increases inflammatory signs that can affect cortisol levels in the fetus and maternal placental genes [6]. Furthermore, depression

and anxiety that occur in pregnant women are associated with the incidence of intra uterine fetal death (IUFD), premature, low birth weight, asphyxia, and congenital abnormalities in newborns. Antenatal depression is also known to be a major trigger for postpartum depression and postpartum depression is a strong predictor of parental stress and lack of maternal and child bonding [1].

Although antenatal depression has a very detrimental effect, anxiety and depression during pregnancy are still less detected so that the treatment has not been maximized [7]. There are several reasons why antenatal depression is less commonly detected than postpartum depression. They are including hormonal changes during pregnancy, community stigma, the tendency of health workers and pregnant women to only focus on physical health care during pregnancy, and early symptoms of depression are often ignored because they are similar to normal pregnancy symptoms such as nausea, weakness, changes in appetite and sleep disorder [1].

In Indonesia, the data from Basic Health Research (Riskesdas) in 2010 shows that prevalence of postpartum depression is 2.32% (440 / 18,937) [8]. Although the incidence of antenatal depression is unknown nationally, antenatal depression that is not treated properly has a great chance to becoming postpartum depression. Research conducted by Annerangi (2013) shows that the prevalence of depression in pregnant women in the Pasar Minggu District Health Center is 14.8% with categories mild 12.2%, moderate 1.7%, and severe rate 0.9% of 107 pregnant women [9]. Another study by Rachmawati (2013) conducted at Sukmajaya and Cimanggis District Health Center showed that 3% of 98 third trimester pregnant women experienced depression before delivery [10]. Another research also conducted at Sukmajaya and Cimanggis District Health Center by Rahmawati (2016) showed that 0.9% of 110 third trimester pregnant women experienced mild depression while 97.3% of third trimester pregnant women experienced mild to moderate anxiety [11].

Several studies have suggested that the main risk factors for antenatal depression are maternal anxiety disorders, stress, a history of previous depression, lack of social support, family violence, and unwanted pregnancy. These risk factors can help health workers to identify mothers with a high risk of depression but do not show any symptoms of depression so that health workers can provide preventive intervention [1]. Antenatal depression is a condition that needs to be identified and treated as early as possible [3]. Detection of antenatal depression that is carried out routinely at least in the first trimester and third trimester will increase the chances of successful interventions in mothers suffering with mental health problems [12].

Smartphone is the most often used device by public to doing communication and almost 27% of smartphone users carry out online activities. With so many smartphone users, the use of an Android-based detection tool can be used in broaden reach [13]. The android-based screening service model can quickly detect mental health disorders so that person who suffering from depression can get proper treatment by professionals [14].

The aim of this study is to design an antenatal depression detection information system, hereinafter referred to as "Care Bumil" (Cegah Depresi Ibu Hamil). Through this information system, it is expected that depressive symptoms in pregnant women can be detected as early as possible so that maternal and neonatal complications can be reduced. the impact of this study is to decrease maternal and infant mortality rates.

2. Method
The method in designing this system uses the prototyping method but at this time only developed in the modeling stage. This system focuses only on the stages of requirements analysis, design and implementation. Data collection for system identification is done by interviewing, observing, and studying literature through searching several books, articles, and journals related to this research.

3. Results and Discussion

The results of this study will describe how the process of implementing antenatal depression detection is performed. This condition is obtained from qualitative study results by interview, observation, and literature study methods. It also explained the system development stage which refers to the prototyping method.

3.1. System Requirements Analysis

System requirements analysis is described in terms of input, process and output to categorize the problems found in accordance with the data obtained.

Table 1. System Requirements Analysis

	Current Conditions	Needs
Input	There is no standard form of antenatal depression detection, depression detection examination has not become a routine examination on antenatal care, and Stigma in the society that depressed mothers are mothers who fail to rise their children.	Designing a standard antenatal depression detection tool that can be accessed personally in pregnant women to reduce stigma.
Process	The service to the patients is not optimal because a lot of task in clinical care and administrative matter (recording and reporting) that should be done by midwives	Developing antenatal depression detection applications that can be done independently in pregnant women and the results can be recorded in the midwife database.
Output	There is no recording and reporting of antenatal depression detection in health care professionals.	Designing a reporting form in an attractive and easy-to-understand output view or interface.

3.2. System Planning

The system planning process will be based on the results of literature studies on antenatal depression management procedures at the National Institute for Health and Care Excellence (NICE) guidelines on clinical management and service guidance of antenatal and postnatal mental health [15]. The process starts from pregnant women filling in the self-assessment data of depression risk factors and filling out the Edinburgh Postnatal Depression Scale (EPDS) questionnaire, then the test results are analyzed by midwives. if antenatal depression is found, the midwives conduct information and counseling, provide support to pregnant women and families, doing coordinate care, monitoring and improve communication with pregnant women. After that, the pregnant woman is examined whether the depression is reduced or lost. If depression decreases, the course of antenatal depression is complete. If depression persists, pregnant women are referred to a psychiatrist / psychologist for further intervention and pharmacology therapy.

3.3. Design System

System design involves identifying and describing the underlying software system and its relationships. The design is divided into several sections, namely:

3.3.1. Context Diagram.

Context diagram is a diagram that shows system boundaries, the interaction of all external entities with the system, and information that generally flows between entities and systems. The context diagram of the application of antenatal depression screening can be seen in the figure 1.

3.3.2. Entity Relational Diagram (ERD).

Entity Relationship Diagram illustrates the relationship between entities in the system. The relationship between entities in detection depression in pregnancy can be seen in the figure 2.

3.3.3. Table Relational Diagram (TRD).

In the development of antenatal depression detection system there are several entities that connected to each other. Relationships between these entities can be described in figure 3.
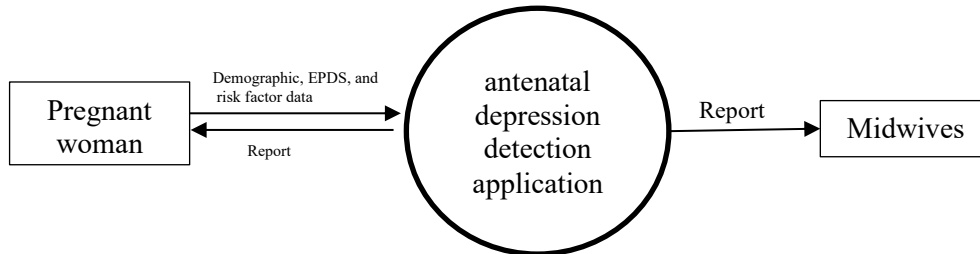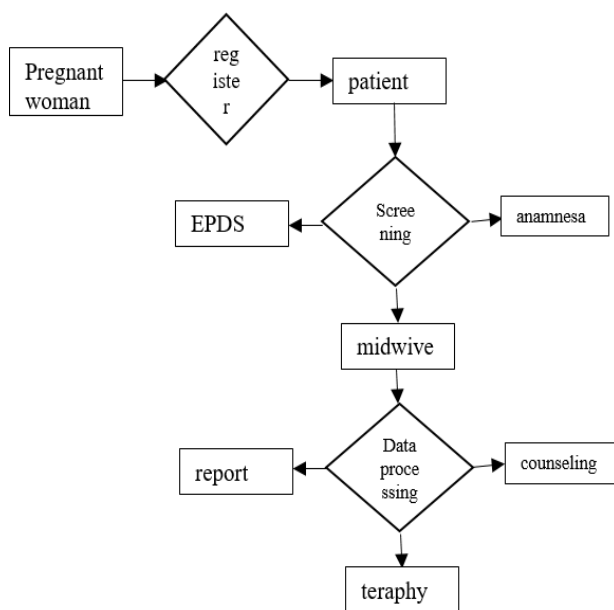

Figure 1. Context Diagram
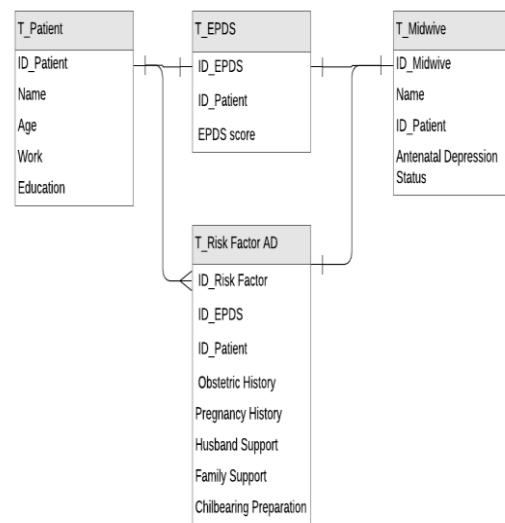

Figure 2. Entity Relational Diagram

Figure 3. Table Relational Diagram

3.4. Model Development for Android-Based Application

Depression and anxiety often occur in pregnant women, especially in third trimester. therefore, detection of depression in pregnancy is needed to reduce the risk of postnatal depression. The key to managing depression is immediate identification through routine detection of midwifery care services. Antenatal depression detection information system is an android-based application designed to record, process, detect, and report the mental health of pregnant women. An overview of Care Bumil application can be seen in the interface system that has been made. Care Bumil application is divided into 2 application models namely the android application model and the web application model. While the android application model contains a menu Tentang Saya, antenatal depression tests using the Edinburgh Postnatal Depression Scale test, a history of EPDS test results, and info, the web application model contains data from the results of detection of depression in pregnant women and their risk factors. the web application model is designed for health care professional especially midwives and the android application model is designed for pregnant woman. The interface form of each menu is as follows:

a)   Register and Login Menu

Register and login forms can be accessed after the user downloads the Care Bumil application. Pregnant women register with their full name, e-mail and password. After completing the registration form, pregnant women will get an email containing a patient ID that will be used to log in to the application.

b)   Tentang Saya Menu

Menu of tentang saya contains depression risk factor assessment consisting of demographic data on pregnant women, current pregnancy history, past obstetric history, husband support, family support, and delivery preparation. The interface of this menu can be seen in figure 4.

c)   Test Menu

This menu contains 10 questions from Edinburgh Postnatal Depression Scale (EPDS) about perinatal depression. The questionnaire in EPDS have been commonly used to detect antenatal and postnatal depression. This tool is reliable, valid, has been translated into several languages and has been used in various populations. The interface of this menu is showed in figure 5.

d)   Test Result Menu

The test results menu contains the score of the EPDS test results showing the level of depression in pregnant women. An EPDS score higher than 13 is used as a reference for estimating antenatal and postnatal depression. this user interface can be seen in figure 6.

e)   History Menu

History menu contains a history of antenatal depression checks performed by pregnant women. In this menu, pregnant women can see a graph of the state of their mental health during pregnancy. The picture of this menu can be seen in figure 7.

f)   Info Menu

The Info menu contains information about the health of pregnancy, childbirth, postnatal, and newborns to increase the knowledge of pregnant women about their health.

g)   Web Interface

The Web Interface used by midwives contains data on antenatal depression detection in pregnant women and their risk factors for further use as a basis in giving patient intervention.

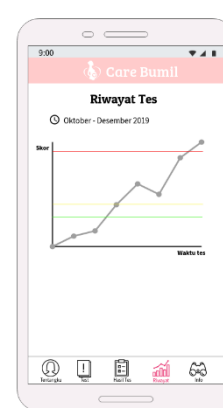**Figure 4.** History Menu   **Figure 5.** Test Result Menu   **Figure 6.** Test Menu   **Figure 7.** Tentang Saya Menu

4. Conclusion

The design of antenatal depression detection information system with this prototyping method supports the improvement of the mental health of pregnant women. The Android-based application approach is based on user needs, namely the need for an effective, efficient, personal depression detection tool that will not compound the workload of midwives. The results of this study identified four of the most commonly used and influential framework methods in system development stage of prototyping method. They are system requirements analysis, system planning, design system, and model development for android-based application. This information system can be developed by organizations involved in improving maternal and child health so that it can be utilized by the general public. This antenatal depression detection information system needs further development so that the system can be applied for future needs.

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