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Developing an android-based application for early detection of postpartum depression symptoms in Indonesia

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Irma Nurbaeti*, Moch Syafii, and Kustati Budi Lestari

Abstract

Background: Postpartum depression has become a mental health problem in Indonesia. Screening symptoms of postpartum depression as early as one month during the postpartum period is needed. A smartphone application is considered one of the fastest ways for screening.

Objective: To develop an android-based application to early detect the symptoms of postpartum depression and evaluate its effectiveness.

Methods: The smartphone application was developed using Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instruction model. The survey design was carried out to evaluate the effectiveness of the application among 109 postpartum mothers selected using convenience sampling. Data were collected from August to October 2019 in South Tangerang, Indonesia.

Results: The evaluation showed that the application is mostly positive. The appearance of the application is adequate (92.67%), easy to download (89.90%), understandable (96.33%), easy to fill-in (94.50%), beneficial (96.33%), new (90.83%), and reflecting psychological conditions (90.83%).

Conclusion: The symptoms of postpartum depression can be measured by the android-based application. It is therefore recommended to Indonesian mothers use this app to detect postpartum depression symptoms early. This app also helps nurses and midwives to prevent depression among postpartum mothers. Also, the app can be imitated by other developers for non-Indonesian mothers.

Keywords

ADDIE model; digital application; android; postpartum depression; smartphone; nursing; Indonesia

Postpartum depression is a serious mental disorder after childbirth, and it is considered a health problem in the community (O'Hara & McCabe, 2013). The World Health Organization (WHO) declared 2017 as the year of depression, and it is predicted in 2030 that depression will be the second leading cause of death after heart disease. Based on the population, postpartum mothers are the second contributor to depression after the adolescent population. This is likely because, in the postpartum period, an average mother is three times more likely to develop depression than other periods (WHO, 2017). Postpartum depression can be called a hidden disease and a silent killer because postpartum depression is not like other mental disorders, such as psychosis or bipolar disorder. Postpartum depression is often invisible, and people will recognize it as a disease if the mother has committed acts to injure herself or her baby, such as abandoning, throwing away, strangling, or killing (Field, 2010; Garthus-Niegel, Ayers, Martini, Von Soest, & Eberhard-Gran, 2017; Hanington, Ramchandani, & Stein, 2010).

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The prevalence of postpartum depression exists in the world. The rate of postpartum depression is between 10% to 40% in the United States of America and European countries (Fiala, Švancara, Klánová, & Kašpárek, 2017; Werner, Miller, Osborne, Kuzava, & Monk, 2015). Similarly, the prevalence in Asia's countries is between 10% to 40% (Kawai et al., 2017; Yusuff, Tang, Binns, & Lee, 2015). Whilst, the prevalence of postpartum depression in Indonesia is between 15% - 28% (Idaiani & Basuki, 2012; Nurbaeti, Deoisres, & Hengudomsub, 2018).

Although postpartum depression exists in the community, its symptoms are not detected early. Almost all the signs of depression begin after a month of postpartum (WHO, 2016). O'Hara and McCabe (2013) stated that the first six months after delivery might represent a high-risk time for postpartum depression. Primipara mothers also have significant symptoms of postpartum depression than multipara mothers at one month of the postpartum period (Qandil, Jabr, Wagler, & Collin, 2016).

According to hospital regulation, a mother will have early discharge on the second day after normal delivery or the fifth day for mothers with cesarean section. A mother usually has a postpartum follow-up, generally on the seventh day, when asked for a checkup. Many mothers, after months, have become less notice of the depression symptoms, which may lead to severe depression, and the babies are at risk of harm.

Screening for postpartum depression in the health service is not available yet nowadays. However, the role of health workers, including nurses, midwives, doctors, and psychologists, to provide a referral system for mothers diagnosed or screened with postpartum depression is very important. If the screening is performed as early as possible, counseling by trained health workers will be more effective in reducing the symptoms of depression.

On the other hand, a stigma towards postpartum mothers with mental health problems in the community also exists. The stigma is related to mood and mental disorder, feelings of disgrace, embarrassment, afraid labeling, and less understanding or less support from family or relatives. In fact, stigmatization towards mothers who have a mental illness is well-known to impede help-seeking (Schmied et al., 2016). In Indonesia, few women are unlikely to seek help from anyone for mental and psychological issues after childbirth because of the stigmatization. Most likely, they seek from family and relatives. This is another challenge both for mothers and healthcare providers.

Therefore, to cope with those problems, an android-based application was developed in this study, considering every mother in Indonesia has at least one smartphone today. This will help mothers to identify the depressive symptoms as early as possible. This study described the application development using Instruction Systems Design (ISD) or Analysis, Development, Design, Implementation, and Evaluation (ADDIE) Model and evaluated its effectiveness.

Developing a smartphone application using the ADDIE model

The instructional systems design (ISD) is a systematic method of developing education and training programs to improve performance (Battles, 2006). The ISD process involves five steps: analysis, development, design, implementation, and evaluation (ADDIE). The concept of ISD has been emerged since the early 1950s and firstly established in 1975. The ADDIE model had been created by the Center for Educational Technology (CET) at Florida State University. The first project of the ADDIE model was for the US Army and adapted by all the US Armed Forces (Hannum & Briggs, 1982). In this study, we developed an android-based application using the ADDIE model as the following:

Analysis

This step aims to analyze the system regarding its characteristics, importance, and limitations and formulate health workers' needs of the system. We analyzed the application by doing an in-depth interview with nurses, medical doctors, and midwives who work in outpatient and inpatient units in hospitals in Tangerang Banten Province and Sukabumi West Java Province, Indonesia. The results indicated that most postpartum mothers often come late to the hospitals after the symptoms of depression become severe. For that reason, all agreed that they need an innovation using a smartphone application to detect the signs of postpartum depression since a smartphone has become a part of everyone's life.

Design

In this step, the outline, description, and contents of the application are created (Hadi et al., 2017). We worked together closely with a software developer based on the results of the analysis step. The design related to pictures, flow, and the system used was discussed. The blue color in the initial logo display was chosen because depression refers to the word "blue," which illustrates the incidence of postpartum depression as a blue event for the mother and baby. We also searched the literature for finding instruments to measure postpartum depression and the effectiveness of the application in terms of ease of use, language, appearance, and benefits.

Development

We created the application based on the design step (Hadi et al., 2017). In this study, the app development was android based, with the name of *tes depresi* (depression test) or Initiative Maternal Screening Depression (IMSD) available in Google PlayStore (https://play.google.com/store/apps/details?id=uinjkt.tesdepresimaternal). The research team developed this app under *Irma Nurbaeti's* name in 2019, and it is available only in the Indonesian language. No login is required for users. We provide the figures of the app for clarity.

Cover page

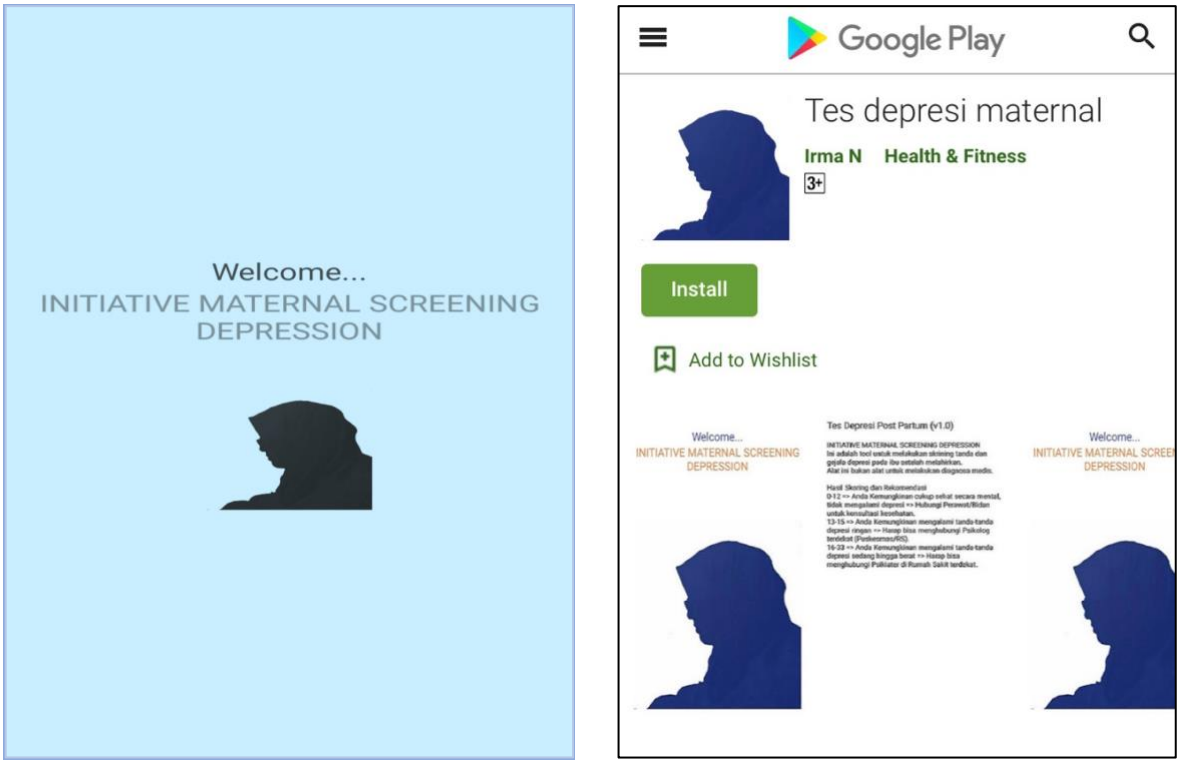

Figure 1 Cover of the application

Characteristics of mother and child

In this app, a mother is asked to provide their information about the mother's picture, health personnel who recommended using the application (if any), socio-demographic characteristics, current obstetric condition, and current baby's condition (See Figure 2).

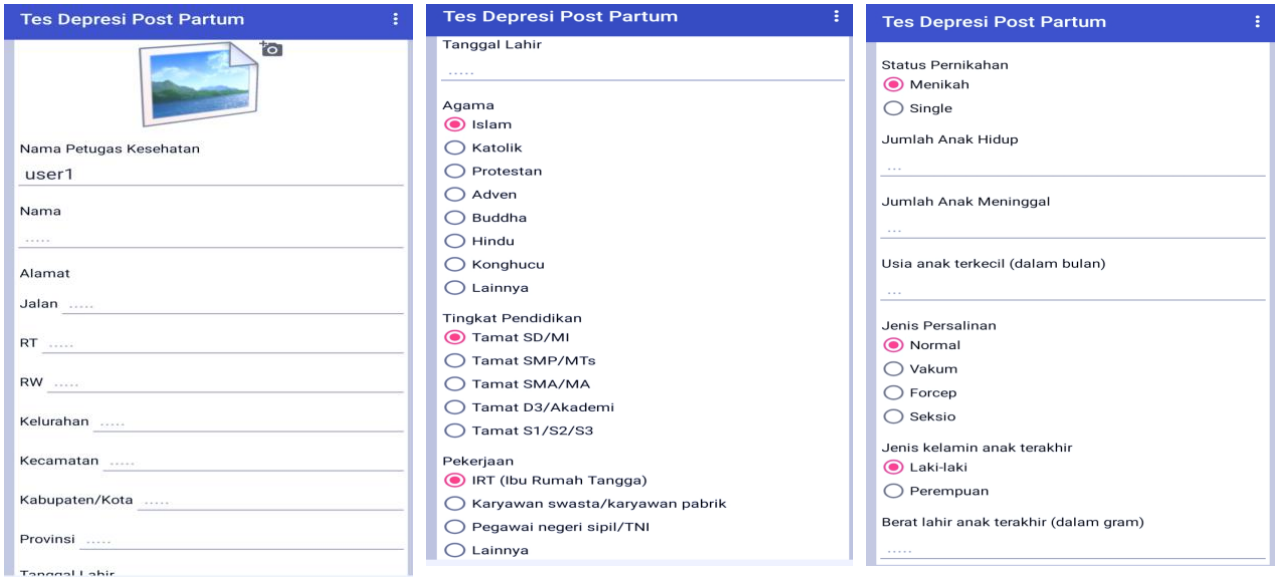

Figure 2 Characteristics of mother and child including name, address, date of birth, religion, level of education, working status, married status, number of children alive, number of children died and type of childbirth, current baby gender, and current newborn weight

The Modified Edinburgh Postpartum Depression Scale (EPDS) – Indonesian version

Figure 3 Modified EPDS - 12 items Indonesia version

Figure 3 shows the instrument used to detect postpartum depression using the Modified Edinburgh Postpartum Depression Scale (EPDS). The EPDS was developed by Cox, Holden, and Sagovsky (1987), and we had granted permission to use the instrument in this application. The original developer stated that the EPDS is not a diagnostic tool; therefore, we describe that our app is a tool for screening signs and symptoms of postpartum depression, not a tool for medical diagnosis of postpartum depression. The Indonesia version of EPDS has already existed since 1998, first translated by Kusumadewi, Irawati, Elvira, and Wibisono (1998).

In this study, we added two items, numbers 10 and 12, suitable for symptoms of postpartum depression in Indonesian mothers. So, the questionnaire consists of 12 items. The validity test of the modified instrument was applied using Spearmen rho, with the results ranged from 0.347 – 0.778. The reliability test was also conducted using

internal consistency, with a Cronbach alpha of 0.78. This indicates that all 12 items of the modified EPDS were valid and reliable.

Output

The questionnaire uses a rating score (0-36), with normal/non-depressed category (0-12), mild to moderate depression (13-15), and severe depression category (16-36) (Bhusal, Bhandari, Chapagai, & Gavidia, 2016; Töreki et al., 2013; Underwood, Waldie, D'Souza, Peterson, & Morton, 2017). Based on the score, a follow-up recommendation was made. If there is no depression or normal, a mother is recommended to keep contact with a nurse or a midwife. If having mild or moderate depression, it is suggested to consult a Psychologist. If a mother has severe depression, she is advised to go to a Psychiatry in the nearest hospital near her place. The example of the output can be seen in Figure 4.

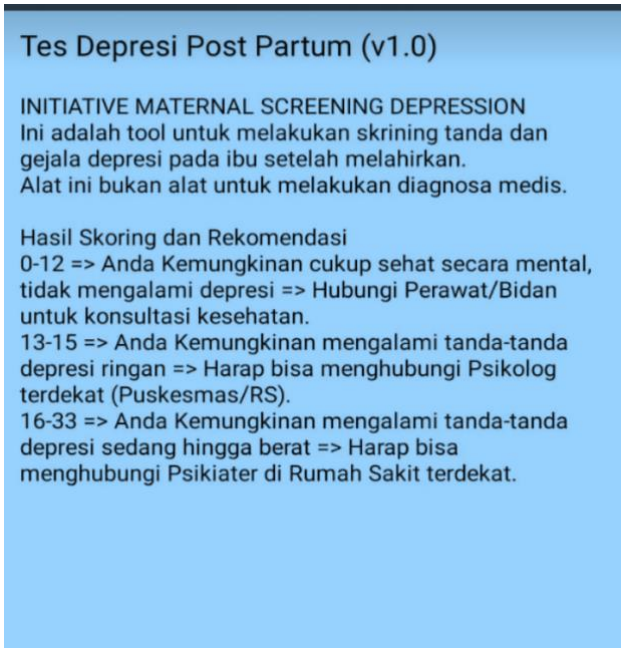

Figure 4 Screening results and recommendation

Implementation

The implementation phase includes testing digital application prototypes to participants (Fajriya, Supriyana, Bahiyatun, & Widyawati, 2017; Kholifah, Supriyana, Bahiyatun, & Widyawati, 2017). In this study, the smartphone application was tested in postpartum mothers, and a survey design was carried out to evaluate the application. Of 123 postpartum mothers who had been contacted, 109 respondents were included using convenience sampling. The inclusion criteria of the mothers were (1) a woman giving birth with lived infant(s), (2) married status, (3) a mother who had no history of mental illness, (4) a mother who was not being treated for complications, (5) could read Bahasa Indonesia, (6) having a smartphone, and (7) agreed to participate in the study. The study setting was conducted at South Tangerang City, Banten Province, Indonesia, for two months, from the second week of August to the second week of October 2019. This application has been registered at PlayStore (Figure 1).

Prior to data collection, the study was approved by the Ethical Committee, Faculty of Health Science, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia, with approval number: Un.01/F.10/KP.01.1/KE. SP/07.08. 001/2019. The study permission was also obtained from the Head of District, Ministry of Health, South Tangerang District, Indonesia, in the study setting.

The researchers and two research assistants did the data collection. The training was conducted to prepare the research assistants about the objective procedure of the study and how to operate the application. After getting a permission letter, the researchers or research assistants had contacted the hospitals, especially the Head of Maternal and Child Units, to identify eligible participants. Potential participants who met the inclusion criteria were invited to participate in the study. Each participant was asked to sign a written informed consent once they agreed to participate. They were also able to withdraw from the study without any penalty. Their identities were kept confidential. After the agreement, the researchers and research assistants visited each participant's home. During data collection, the participants were asked to download the application and follow the procedure (filled in the questionnaire). Data collection in each participant approximately spent from 10 to 15 minutes.

Evaluation

In this step, the android-based application has been evaluated by 109 postpartum mothers using the questionnaire. Table 1 shows the characteristics of the participants, in which the level of education of the participants tended to be similar between the elementary, high school, and graduated school, 36.70%, 28.44, and 34.86%, respectively. More than half of the participants (63.30%) were housewives, and more than two-third (66.06%) had two children and more. Of all participants, 74.31% had a normal birth, and 55.05% had a baby girl at the recent childbirth. The participants' ages ranged from 16 to 50 years old (mean 30.98, *SD* 6.18).

Table 1 Characteristics of the participants (*N*=109)

Characteristic	Category	*n*	%
Level of education	Elementary school	40	36.70
	High school	31	28.44
	University	38	34.86
Working status	Housewives	69	63.30
	Working	40	36.70
Number of children	One child	37	33.94
	Two or more	72	66.06
Type of labor	Normal	81	74.31
	Cesarian	28	25.69
Baby gender	Boy	49	44.95
	Girl	60	55.05

Table 2 shows the results of the app evaluation. The app was considered very easy (55.96%) and easy (33.94%) to download. Almost all participants (94.50%) also responded quite easy to fill out the application, and most of them (96.33%) answered the language used in the application was easy to understand. The majority of the participants described the display or appearance of the application as very interesting (65.2%) and interesting (27.53%). While they also claimed that they never used a similar test before (90.83%). Most participants said it was useful (96.33%) and reflected their psychological condition (90.83%). Almost all respondents (97.25%) will recommend this application to others.

Table 2 Evaluating of Application (*N*=109)

Characteristic	Category	*n*	%
Easy to download the application	Very easy	61	55.96
	Easy	37	33.94
	Remain difficult	6	5.50
	Difficult	5	4.60
Easy to fill in the application	Very easy	67	61.47
	Easy	36	33.03
	Remain difficult	1	0.90
	Difficult	5	4.60
Language	Very understandable	67	61.47
	Understandable	38	34.86
	Difficult to understand	4	3.67
Display of application	Very interesting	71	65.14
	Interesting	30	27.53
	Less interesting	6	5.50
	No-interesting at all	2	1.83
Previously used the similar application	Yes	10	9.17
	No	99	90.83
Beneficial	Yes	105	96.33
	No	4	3.67
Reflecting psychological conditions	Yes	99	90.83
	No	10	9.17
Recommended to others	Yes	106	97.25
	No	3	2.75

Implication for nursing and midwifery practice

Several implications of this study for nursing and midwifery practice: First, the Android-based app developed in this study can be used by nurses and midwives in their practice, especially for postpartum care. The best time for screening postpartum depression is in the first month of postpartum (Nurbaeti et al., 2018). However, the gap persists, which the detection of postpartum depression among mothers still often missed due to the regulation of the hospitals in regards to the length of stay. So, the app can be used before, during, and after follow-up; or introduced during discharge planning.

Second, considering the stigma that still exists in the Indonesian community towards mothers with depression and other mental health problems, the app is very useful for mothers for self-assessment of postpartum depression. Mostly the mothers do not want to come to hospitals to check their conditions due to the stigmatization. However, it is not the best solution; stop stigmatization among mothers is necessary to do.

Third, the app should also be used in hospitals and public health centers in Indonesia. Many mothers often visit the public health centers first before going to the hospitals for follow-up. The app could be used in a routine postpartum program, especially in the early detection program in public health centers.

Fourth, the app will help nurses and midwives explore and understand the mothers' mental health based on the output category. At this point, the nurses and midwives may provide nursing and midwifery interventions to reduce the depression symptoms, and they should have the ability or improve their competency.

Last, the app was easy to download and use, easy to fill-in, sound, new design, interesting, and reflected their current condition. Therefore, this study serves as an input or idea for non-Indonesian developers to help mothers detecting post-partum depression.

Limitation of the study

The application can be accessed only via android smartphone, not via i-phone or laptop/computer, which needs further development. The use of a descriptive survey might limit the evaluation of results of the effectiveness of the app. Therefore, further studies are required to measure the efficacy, accuracy, and conformity using experimental designs.

Conclusion

It can be concluded that screening for postpartum depression using the smartphone application was practical and easy to use by postpartum mothers to detect the symptoms of postpartum depression. This innovation could have a positive contribution to nursing and midwifery practice to help reducing depression among mothers.

Declaration of Conflicting Interest

There was no conflict of interest to declare.

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Authors' Contributions

All authors contributed to the study's conception and design. IN conceptualized the study. IN, KBL, and MS collected data. IN and MS performed data management and analyses. IN, KBL, and MS drafted the original version of the manuscript and provided critical revisions. All authors have approved the final manuscript.

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Data Availability Statement

The datasets generated during and/or analyzed during the current study are available in the supplementary file.

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