



Early Detection and Monitoring of Hypertension in Pregnant and Postpartum Women Using the 'E-Demos' Smartphone App.

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ABSTRACT

Acceleration of early detection with digitalization can be done by the community with the help of a simple android-based application called e-Demos (Early Detection and Monitoring of Hypertension). The purpose of this study is to create a model for the development of health technology in the medical world using the android studio application on a smartphone, to determine the effectiveness of the "E-Demos" application instrumentation in detecting and monitoring hypertension in pregnant and postpartum women. This type of research is an experimental study with a quasi-experimental approach with a non-equivalent control group design. The development of this application uses the ADDIE model development. The sampling technique uses the accidental sampling technique method. Research results In the results of the significance p_value of $0.000 \leq 0.05$, it is said to be significant, so it is concluded that the Early Detection and Monitoring of Hypertension (E-Demos) application can increase the knowledge of pregnant and postpartum women. the conclusion that E-Demos is suitable for early detection of hypertension in pregnant and postpartum women.

Keywords: Applications, Early Detection, Hypertension, Monitoring, Pregnant and Postpartum Women

INTRODUCTION

Maternal Mortality Rate (MMR) reflects the risks faced by mothers during pregnancy, childbirth, which are influenced by the mother's nutritional status, socio-economic conditions, poor conditions before pregnancy, the occurrence of various complications during pregnancy and childbirth, the availability and use of health care facilities including perinatal and obstetric services. Maternal deaths usually occur due to lack of access to quality health care, especially timely emergency health care services which are caused by late recognition of danger signs and making decisions, late recognition of danger signs and making decisions, late reaching health facilities, and late receiving services at health facilities. (Suparti, S. 2018).

According to WHO (2021) MMR is around 395,000 cases of maternal deaths worldwide due to pregnancy and childbirth. According to ASEAN (2021) MMR is 235,000 per 100,000 live births. Based on data from the Maternal Perinatal Death Notification (MPDN), the number of maternal deaths in 2022 reached 4,005 and in 2023 increased to 4,129 (Yuni S, 2024).

Pregnancy hypertension, or preeclampsia, is a serious health problem in pregnant women, with an incidence of around 3-8% worldwide. In Indonesia,

around 5-15% of pregnant women experience hypertension during pregnancy (Nurfitriyani, 2022)

The results of the study by Wuri, Ayu and Andriana 2018 explained that out of 92 million, 32% accessed health applications. One of the applications that is currently developing is an application to detect a disease (Mathews et al 2019: Yousaf et al 2020). Research that has been conducted by Teo et al shows that users of early detection health applications want applications that have features that are easy to use, easy to operate and have social connectivity. Early detection of hypertension is one of the screening tools designed for the general public, especially pregnant and postpartum women in this digital era, where with smartphones that are widely owned by teenagers in particular, they can easily access early detection of hypertension without having to measure pressure. (Garabedian, L.F., et.al. 2019)

Acceleration of early detection with digitalization can be done by the community with the help of a simple android-based application called e-Demos (Early Detection and Monitoring of Hypertension). The use of information technology and digitalization in accelerating early detection of hypertension risk factors through this application makes it easier for the

community to carry out self-assessment or independent assessment. In addition, for health workers, this application also makes it easier for them to find out data on hypertension conditions in their area. This can encourage a paradigm shift, which was originally health workers in health facilities looking for patients to treat, now changing to people who need treatment because they can find out the risk factors themselves with the educational element in the self-assessment.

METHOD

This research was conducted in the Soropia District, Konawe Regency in July - August 2024. After obtaining a recommendation for approval from the Nani Hasanudin Health Science Ethics Commission no: 1135 Stikes-NH / KEPK / III / 2024.

This study uses the method and development of an Android application to obtain data digitally. This research is a development using the ADDIE model. The research was conducted by creating an application product to detect and monitor hypertension in pregnant women and postpartum women and postpartum women in the form of an Android application using ispring suite 9. The development of this application uses the ADDIE model development. 1 states that the stages of ADDIE consist of five stages:

Analyze, Design, Development, Implementation, and Evaluation. The sampling technique uses the accidental sampling method. The sampling technique is a random sampling technique of 30 people. The researcher uses the normality test using the Shapiro-Wilk method because the sample used is ≤ 50 samples, because the results of the normality test obtained are not normally distributed, the researcher uses the Wilcoxon test to determine the results of the pretest - posttest on pregnant women and postpartum women.

RESULTS AND DISCUSSIONS

Result

A. Definition stage (Define)

At this stage is the initial stage that must be started before the design of this application itself. Where at this stage the researcher conducted a Focus Group Discussion (FGD) as well as an initial analysis to identify problems that often occur at the Soropia Health Center often faced by health workers in detecting and monitoring hypertension. Participants in this FGD were dr. General, midwife coordinator, village midwife, and cadres. At this stage during the discussion it was found that the problem in the Soropia Health Center work area was that the incidence of hypertension in pregnant

women and postpartum women was quite high and where the obstacles were hampered by inadequate internet networks. The FGD participants gave their opinions and input, that pregnant women and postpartum women in the Soropia Health Center work area still had insufficient knowledge, and lack of awareness in checking and monitoring their blood pressure at health service centers, seen from mothers who came to health service facilities on average after being at risk, did not know they were at risk, and most pregnant women and postpartum women did not want to go to health facilities to have pregnancy checks.

B. Planning Stage (Plan)

At this stage, an application plan is produced. This application plan stage aims to design the application that is developed as follows:

1. Application Selection

The selection of applications is adjusted to the results of the material analysis that has been carried out and adjusted to the wishes, suggestions of the discussion participants and from the results of the FGD discussions that have been carried out. The applications used are applications for pregnant women and postpartum mothers.

2. Format selection

The selection of the intended application format is to design or plan the contents of the application that is adjusted to the material / problems that have been determined from various sources and from the results of suggestions from FGD participants. The selected application development format can characterize the benefits of the Application which contains a description of the client's condition with the results of health monitoring carried out periodically and also contains education that can later be understood by pregnant and postpartum mothers. The contents of the application are:

- a) The application is equipped with the identity of each pregnant and postpartum mother
- b) There are materials on Early Detection of Hypertension, which are complete with various images and tips for preventing hypertension
- c) The application has an evaluation, to test the ability of pregnant and postpartum mothers after using the application
- d) The application is equipped with a screen to find out, or detect yourself, whether you are at risk of pregnancy
- e) The application is also equipped with a monitoring menu, namely the

results of blood pressure checks every month.

C. Preliminary Plan (design)

The initial design results in this phase include the application design used to obtain the data needed in the development process. The application design refers to the results of the analysis that has been carried out in the definition stage and other phases.

Previously, at this design stage, draft 1 was produced. This phase will produce a product in the form of an application that will be developed at the development stage. The results of the media design that will be developed, the application media at this stage, are application media that are more attractive and easy to use.

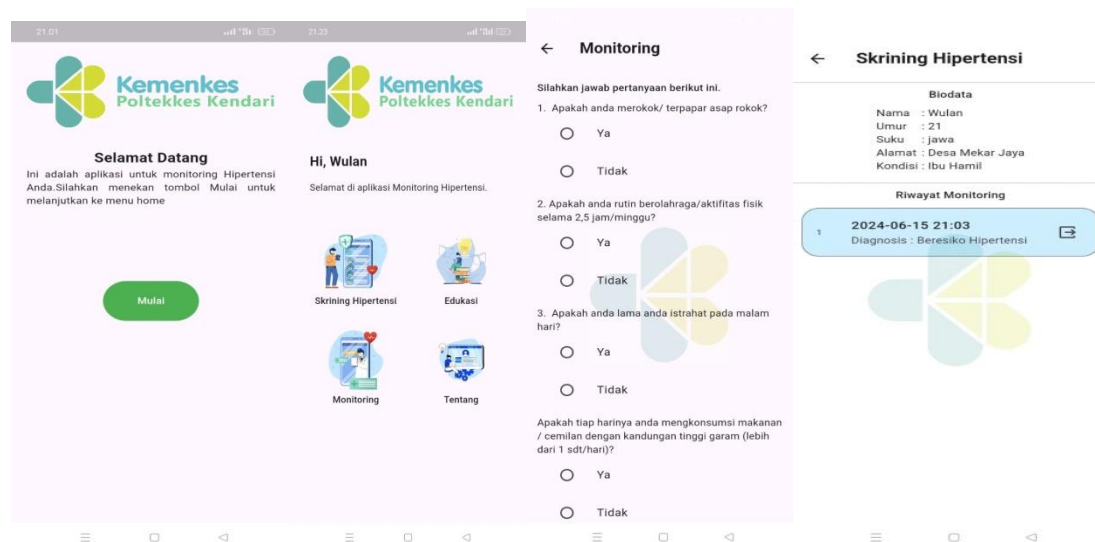


Figure 1. Initial Draft of E-Demos Application

D. Development stage (Develop)

This stage is the process of making the Early Detection and Monitoring application product and improving the product through validation and revision tests. This application is produced using the software inspiring suite 9. This application is made in the form of an android application. After the product maker is finished, the application is validated by the media expert and material expert. The instrument used is a

questionnaire instrument. The questionnaire instrument is intended to determine the feasibility of the learning media in the form of an android application that is being developed. The learning media validation sheet consists of an evaluation of the validation assessment of media experts and material experts. Media experts adopt from experts While material experts adopt according to the National Education Standards Agency (BNSP). The evaluation criteria on the

media expert validation sheet include aspects of media appearance, programming and usefulness. While on the expert validation sheet

The material includes aspects of content feasibility, conceptual feasibility, presentation feasibility and language feasibility. This stage is to produce the final form of the application after going through revisions based on input from experts and trial data. The steps taken at this research stage are:

1. Expert validation

The next stage that will be carried out after the design stage is the validation

stage carried out by 2 validator experts, namely media experts and material experts. These validators are asked to validate the media that has been produced at the design stage (draft application 1). media that will be developed at the development stage. The results of the media design that will be developed at this stage are applications that are more attractive and easy to use as a reference for assessment in revising the media that has been developed. The suggestions and input given by the validator when analyzing image 1 are as follows:

Table 1 1. Results of Media Revision Based on Expert Validation of the Early Detection and Hypertension Monitoring Application (E-Demos)

Before Revision	Revision Results
1. The writing and background on the cover are too simple	1. Background and writing have been updated to be more interesting
2. Complete with the author's name	2. The author's name has been moved
3. The educational material is clear but too stacked and less interesting so that readers will get bored	3. Educational materials have been made into a separate menu to make them easier to understand
4. On the menu page, the menu icon is less attractive and does not match the theme of the application	4. Images and materials are appropriate
5. Make sentences that are easy to understand	5. Sentences have been corrected to make it easier for readers to understand
6. On the screening menu, the calculation results should come out directly	6. In the screening menu, the examination results are categorized as Risky / Not Risky

Source: Primary Data 2024



Figure 2 Final Design of E-Demos Application

Media assessment is done by providing Figure 2 along with the assessment sheet to the validators. The results of the assessment can be seen in the following table:

Table 2: Media Expert Assessment Results for the Early Detection and Hypertension Monitoring Application (E-Demos) seen from the aspects of media appearance, programming and usefulness.

Aspect	Mark
Media View	3.35
Programming	3,35
Benefits	3,5
Average Value	3.33

Source: Primary Data 2024

From the table above, the average assessment of media experts is in the very good category. From the assessment indicators, Media Display 3.35, Programming 3.35, Usefulness 3.5 and the average value of the results is 3.73. Judging from the normal value, it is said to be very good if the average value is 3.26 - 4.00,

Table 3. Assessment of the Results of Material Experts on the Application of Early Detection and Monitoring of Hypertension (E-Demos), from the Aspects of Content Suitability, Language Presentation and Contextual.

Assessment Aspects	Mark
Content Feasibility Aspect	3.6
Presentation Feasibility Aspect	3,89
Language Feasibility Aspect	3,89
Contextual Feasibility Aspect	3,6
Average Value	3,78

Source: Primary Data 2024

Judging from the table above, the average assessment of material experts is in the very good category. From the assessment results indicator, the content feasibility aspect is 3.6, the presentation feasibility aspect is 3.89, the language feasibility aspect is 3.89, the contextual feasibility

aspect is 3.6 and the average value is 3.78.

Judging from the normal value, it is said to be very good if the average value is 3.26 - 4.00, so it can be concluded that this application is worthy of being used and tested in the field

1. Limited trial

The revised media (application) was then tested on pregnant women and postpartum women in the Soropia Health Center working area, totaling 6 pregnant women and postpartum women, the researcher

conducted a limited/small sample test in the Health Center working area so that later there would be no bias between the limited sample test and the large sample test. Based on the limited trial, the following results were obtained:

Table 4 Limited Trial Assessment of 6 Pregnant and Postpartum Mothers on the Early Detection and Hypertension Monitoring Application (E-Demos)

Pregnant women and postpartum mothers	Media Aspect	Language Aspect	Usefullnes Aspect	Average Value
1.	3,5	3,5	4	3.61
2.	3,83	4	3,83	
3	3,83	3,5	4	
4	4	3,33	4	
5	3,33	4	3,33	
6	3,5	3,5	3,67	
Average Value	3,71	3,39	3,73	

Source: Primary Data 2024

Judging from the results of Table 4, the average assessment of 6 pregnant women and postpartum / postpartum mothers is in the very good category. From the assessment indicators of the Media Aspect, 3.71, Language 3.39 Usefulness 3.73, and the average score of 3.61. Judging from the normal value, it is said to be very good if the average value is 3.26 - 4.00, so it can be concluded that this application is feasible to be used and tested in the field for a large sample

E. Dissemination stage (Disseminate)

The media (application) that has been designed, and has been validated by 2 experts, namely media and material experts, and a limited trial was carried out on a sample of 6 pregnant women and postpartum mothers, the application in Figure 2 was produced. At the dissemination stage (dissemination) it was carried out on a large sample, namely 30 pregnant women and postpartum mothers in the Soropia Health Center work area, Soropia District, Konawe Regency. The aspects observed from the pretest and posttest results are as follows:

1. Average value of respondents' results

Table. 5 Pretest and posttest knowledge results of the Early Detection and Monitoring of Hypertension Application (E-Demos)

Aspects Observed	Result Standard	Mark
Pretest	12,27	48,87
Posttest	11,33	89,23

Source: Primary Data 2024

From the results of Table 5 above, it can be seen that the knowledge of pregnant women and postpartum mothers before and after being given the application is very different. In the initial knowledge (pretest), a value of 48.87% was obtained, included

in sufficient knowledge, where the normal result of poor knowledge is 40-55%, after the mother was given an explanation and given the application, the knowledge of pregnant women and postpartum mothers increased, as seen from the results of the

post-test value of 89.23% included in very good knowledge, where the normal result of very good knowledge is 76-100%.

2. Normality Test

from the tested data can be determined by simply reading the sign value (p_Value) in the Spss output. The requirement for normal distribution data is if the p_Value value ≥ 0.05 . This normality test uses the Shapiro-Wilk method whose output can be seen in the following table

Table 6 Pre and Post Test Values of the Application (E-Demos). Decision making from the results of the normality test using the Shapiro_Wilk

Based on the results of the pretest and posttest data normality test, it is said that the data has a p_Value value of 0.001. Thus, because the value of $0.001 \leq 0.05$, it can be concluded that the pretest and posttest data are not normally distributed.

1. Wilcoxon Test

This test is used to find out whether there is a change in a respondent before and after receiving the application (treatment). The hypothesis with the following details:

- If the probability (Asymp.Sig) ≤ 0.05 , then it is significant
- If the probability (Asymp.Sig) ≥ 0.05 , it is not significant.

Table 7 Results of Knowledge of Pregnant and Postpartum Mothers Regarding the Early Detection and Monitoring of Hypertension Application (E-Demos)

Test	Median	Minimum-maximum	<i>p-Value</i>
Pretest (n=30)	50	5,67 – 4,33	0.000
Posttest (n=30)	89,67	20-80	

Source: Primary Data 2024

The table above shows that the median pretest value of 50 from the data can be categorized as Pregnant and postpartum mothers having Poor knowledge, with a norm value of 50-66 and for the posttest 89.67 Pregnant and postpartum mothers have very good knowledge where the normal value is 81-100. In the results of the significance p_value of $0.000 \leq 0.05$, it is said to be significant, so it is concluded that the Early Detection and Monitoring of Hypertension (E-Demos) application is able to improve the knowledge of pregnant and

postpartum mothers. The diversity of applications to improve knowledge is very helpful. This development research has produced the Early Detection and Monitoring of Hypertension (E-Demos) application. The application results of this development are arranged systematically and attractively so that they are easy to understand and use independently.

Discussion

A. Application Development Process

According to Sugiono, Research and Development (R&D) is a research method used to produce certain products, and test the effectiveness of these products on the knowledge results of pregnant and postpartum mothers (Sugiono, 2018 & Fitriah N.S, 2015). The process of developing application learning media using the ADDIE development model. which is modified by Tiagarajan consists of five stages, namely defining, designing, developing, disseminating and evaluating (E). The stage that begins with an initial analysis that aims to identify and determine the basic problems faced, determine the media to be developed and analyze the material aims to identify, compile the materials that will be included in the application that will be studied by pregnant and postpartum mothers. Conducting an initial knowledge analysis of pregnant and postpartum mothers to determine the characteristics of the knowledge of each pregnant and postpartum mother, to formulate each discussion that will be discussed in the application that will be used. Next, prepare the application in Figure 1. In this preparation there are 3 steps, namely:

1. Media selection, the media selection chosen is an application that will be used for pregnant and postpartum

mothers as one of the media that can increase knowledge.

2. Format selection, format selection that is adjusted to the user's wishes, writing using formal language according to the results of the FGD participant discussion. The results of the product analysis are used as a reference for compiling an initial product for detecting the risk of hypertension in pregnancy.
3. The initial design in question is in the form of a draft of Figure 1. The content of the material presented in this application is in the form of important things for pregnant and postpartum mothers to know about Early Detection and Monitoring of Hypertension (E-Demos). The menus in this application are in the form of a screening menu, an education menu, a monitoring menu, and a menu about the application

The menus presented in this application can help pregnant and postpartum mothers in detecting and monitoring hypertension independently, because it is equipped with a way to do screening/checklist of hypertension risks that can help mothers in detecting the risk of hypertension. The next stage is the application development stage. At this stage, namely evaluating learning media through several processes, namely: expert validation, revision, and limited trials and large sample trials, so that the

application is valid and effective so that it is suitable for use.

B. Validity level

The steps of validity analysis are as follows. First, the application quality assessment data from experts (validators) and usage samples, the average of each assessment of each aspect is calculated. After that, the average score is compared with a certain range and scale of values. The range and scale of values used in this study are presented in table 2. The application is said to be valid if the analysis results are in accordance with the specified range and scale of values. From the results of the assessment of the material validator, it can be seen in table 3 that the average value is 3.78 with valid or very good criteria, seen from the aspects of the Media Display assessment indicator 3.35, Programming 3.35, Usefulness 3.5 and the average value of 3.73. The media validator can be seen in table 2, an average value of 3.78 is obtained, which means that the application is included in the valid or very good criteria seen from the assessment results indicator of the content feasibility aspect 3.6, the presentation feasibility aspect 3.89, the language feasibility aspect 3.89 and the contextual feasibility aspect 3.6. From the results of the validator, it can be said that the Early Detection and Hypertension Monitoring (E-Demos) application media is included in the valid or

very good category, with a range and scale of values 3.26 - 4.004. Where this research is in line with research. Research that has been carried out by Teo et al shows that users of early health detection applications want applications that have features that are easy to use, easy to operate and have social connectivity. Another thing that must be considered besides the appearance of the health screening application is its ability to store personal information and the user's medical history safely.

C. The level of effectiveness of the application

From the results of the analysis of the knowledge of pregnant and postpartum mothers regarding the application of hypertension risk detection in pregnancy. The results of the pretest knowledge value of 50 from the data can be categorized as pregnant and postpartum mothers having less knowledge, with a norm value of 40-55 and after being given the application of hypertension risk detection in pregnancy, the increase in knowledge of pregnant and postpartum mothers increased, seen from the results of the posttest of 89.23 indicating that pregnant and postpartum mothers have very good knowledge where seen from the knowledge assessment scale 81-100. In the results of the significance p_value of $0.000 \leq 0.05$, it is said to be significant, so it is concluded that the

application of hypertension risk detection in pregnancy can increase knowledge in pregnant and postpartum mothers. One of the applications that is currently developing is an application to detect a disease. Early detection of hypertension is a screening tool designed for the general public, especially teenagers in this digital era, where with smartphones that are widely owned by teenagers in particular, they can easily access early detection of hypertension without having to measure blood pressure and understand the risk factors for hypertension symptoms. Various research results show that subjects' knowledge about hypertension 7 Another study on "Evaluating the Quality of Self-Report of Hypertension and Diabetes" showed that Se and Sp were 48.9 and 96.3%, respectively. This innovation is expected to provide input for health policies related to non-communicable diseases, especially hypertension. Another goal that can be achieved through this innovation is to reduce the gap in health status by implementing multidisciplinary science between policy and digital technology. This strategy is considered more effective and can reduce costs than conducting extensive health screening. According to Brugues et al, the approach through a personal mobile system is more effective in meeting the needs of the next generation, especially in lifestyle

modification. In addition, the application has the potential to prevent the burden of chronic disease in the world because of its ineffectiveness in improving public health without being constrained by distance and time. The development of the Hypertension E-Demos application for early detection and Monitoring of hypertension on smartphones can influence hypertension prevention measures and help the community to know the risk factors that cause hypertension so that the community will increase and improve a healthy lifestyle.

CONCLUSION

Through this study, it can be concluded that the Android-based Hypertension E-Demos application is suitable for early detection of hypertension in pregnant and postpartum women. Recommendations for the use of wider samples or the need to develop applications so that they can be easily accessed by service officers by developing online applications so that they can be used effectively at any time.

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