THE EFFECT OF THE APPLICATION "MATTAMPU", AN EDUCATIONAL MEDIA REGARDING PREGNANCY DANGER SIGNS ON PREGNANT WOMEN KNOWLEDGE

1SHARFINA HASLIN, 2 SYAFRUDDIN SYARIF, 3 MARDIANA AHMAD
4 ELIZABETH C.,JUSUF, 5 ESTHER SANDA MANAPA, 6 BURHANUDDIN BAHAR

1Midwifery Study Program, Postgraduate School, Hasanuddin University, Makassar
2Technology Study Program, Postgraduate School, Hasanuddin University, Makassar
3Midwifery Study Program, Postgraduate School, Hasanuddin University, Makassar
4Medical Science Study Program, Postgraduate School, Hasanuddin University, Makassar
5Marine Science Study Program, Postgraduate School, Hasanuddin University, Makassar
6Nutrition Science Study Program, Postgraduate School, Hasanuddin University, Makassar

CORRESPONDING AUTHOR:
SHARFINAHASLIN, S.TR.KEB
Midwifery Study Program
Postgraduate School, Hasanuddin University, Makassar
Hp: 081269363593
Email: sharfinahaslin97@gmail.com

ABSTRACT

Pregnancy danger signs are signs experienced by the mother during pregnancy that indicate complications in pregnancy that require immediate action. Knowledge is a collection of information from the results of someone's sense of an object through the five human senses. This study aimed to assess the effect of the application of pregnancy danger signs educational media on pregnant women's knowledge. This study, conducted in the BojoBaru Health Center Work Area in January 2021 - March 2021, used a quasi-experimental research design with a non-equivalent control group pre-test and post-test design. Respondents divided into the treatment group (26 pregnant women who obtained "Mattampu" educational application for pregnancy danger signs) and the control group (26 pregnant women who obtained MCH (Maternal and Child Health) book for two weeks). The Wilcoxon test, and Mann-Whitney test used to analyse the data. The results showed there was an effect of the educational media's application on the danger signs of pregnancy on the mother's level of knowledge (p = 0.000 <0.05). There was a significant difference in maternal knowledge level between the group given the application of pregnancy danger signs and the group given education with the MCH Handbook (p = 0.000 <0.05).

Keywords: Android, Pregnancy Hazard Signs, Knowledge

I. INTRODUCTION

Internet technology nowadays is growing very rapidly. Every day around 4.54 billion people use the internet worldwide. From the data quoted from We Are Social, in 2020, Internet users in Indonesia will reach 175 million people (We Are Social &Hootsuite, 2020). Internet technology is currently found in many Smartphones. Today's smartphones are equipped with social media sites and ‘app’ software applications (Lupton, 2016). Android is a form of technological development today, where it is estimated that by 2021 Android users will reach 1.5 billion (Alzaylaee et al., 2020).
Everyone uses the internet to get the necessary information. This information can be found on the internet for anyone who accesses it. Pregnant women are motivated to get the information needed during pregnancy (McCarthy et al., 2020).

Pregnancy danger signs are signs that the mother greets during pregnancy that are used as warning signs. This pregnancy danger sign is used by mothers and health care providers to indicate that pregnancy complication must be taken immediately. One of the main factors causing maternal death is the mother’s lack of knowledge and insight into pregnancy’s danger signs (Dessu, 2018).

Every woman needs to know and be aware of any danger signs during pregnancy due to unpredictable complications. During pregnancy, the danger signs are bleeding, blurred vision, seizures, dizziness, swelling of the feet and hands, and fever (Morhason-Bello et al., 2016; Mwilike et al., 2018; Salem et al., 2018).

Several factors are causing maternal death, one of which is a lack of knowledge within the scope of women, families, and medical personnel about the danger signs of pregnancy. Most of the causes of maternal death are also due to delays in decision making and delays in receiving appropriate action (Akililu Solomon, 2015; Jungari, 2020).

The importance of knowledge about the danger signs of pregnancy will help mothers and families make the right decisions to get prompt and appropriate care, reducing maternal mortality (Mwilike et al., 2018).

Maternal Mortality Rate (MMR) is very high from year to year. The World Health Organization (2017) said that during 2017 the MMR was 295,000, 35% lower than in 2000, estimated at 451,000. Most of the complications experienced by mothers during pregnancy, some of these complications can be prevented and treated. Nearly 75% of the high MMR rate causes are heavy bleeding, infection, hypertension, complications during delivery, and unsafe abortion (Say et al., 2014; WHO, UNICEF, UNFPA, 2019).

In the Health Profile (2019) 2019, MMR in Indonesia remains high, with 4,221 mothers who died due to complications during pregnancy, childbirth, and postpartum. Complications that may occur was included bleeding (30.32%), hypertension (25.25%), infection (4.9%), circulatory system disorders (4.73%), metabolic disorders (3.71%), and others (31.05%). South Sulawesi is recorded to have contributed 3.41% to the maternal mortality rate in Indonesia. In the Health Profile of South Sulawesi (2018), MMR in 2017 in South Sulawesi Province as many as 50 people (Ministry of Health of the Republic of Indonesia, 2020; South, 2018).

Based on the PWS-KIA report of the District Health Office. Barru South Sulawesi in 2019 recorded that there were 3,420 pregnant women. Mothers who visited at least four times during pregnancy (K4) were 3,145 (91.95%). From this data, more than 300 pregnant women did not do K4, so that pregnant women who did not do K4 can cause potential complications in pregnancy and childbirth. Because during pregnancy, especially in the first and second trimesters, many danger signs are encountered. So mothers need to get education on danger signs during pregnancy.

Awareness by mothers and families about danger signs during pregnancy will encourage mothers to make regular pregnant visits to decrease maternal mortality and mortality rates. It is related to the realisation of Sustainable Development Goals (SDGs) number 3. It has become one of the targets that must be achieved in 2030, including reducing MMR globally to less than 70 per 100,000 live births (Johnston, 2016; Ossai, 2015).

The WHO recommendation regarding Antenatal Care (ANC) checks is at least eight times. However, in some countries like Indonesia, it is still trying to achieve 4 ANC visits (WHO, 2016). Research shows that perinatal and maternal mortality is partly due to the number of ANC visits less than three times during pregnancy. A survey conducted by UNICEF in 2018 found only half of women worldwide meet the ANC visits recommended by WHO. As many as 86% of pregnant women underwent ANC examination by health personnel once, only 3 out of 5 (62%) pregnant women fulfilled the complete ANC visit. (Tessema & Animut, 2020).

Providing education to pregnant women is one way to reduce MMR. However, only 54% of pregnant women receive proper and efficient health education. It calculated from the average satisfaction rate of pregnant women who receive ANC services from health workers of 67.38%. The average dissatisfaction of pregnant women is
48.20%. This figure shows that the quality of ANC services and service management in Indonesia is still a critical issue (Farhati et al., 2018; Lestari, 2010; Maiyana, 2018).

A study shows that providing cellular-based education can be well received by the community. For instance, such as providing education about mothers' physiological changes during pregnancy, or fulfilling maternal nutrition, and psychological and physiological changes experienced by mothers ( Parsa et al., 2019).

From the researchers' initial survey data, it was obtained that only four mothers from 10 pregnant women knew about the danger signs of pregnancy. Based on the description above, it was found that providing education about the dangers of pregnancy is very important. Therefore, the researcher developed an android-based application to study the effect of educational media applications on android-based pregnancy danger signs, named "Mattampu", on the Knowledge of Pregnant Women.”

II. MATERIALS AND METHODS

Location and Research Design
The research was conducted at the BojoBaru Community Health Center, Barru Regency, South Sulawesi. The research type was Quasi Experiment (non-equivalent control group pre-test and post-test)(Sugiyono PD, 2016).

Population and Sample
The population is all pregnant women in the BojoBaru Community Health Center, with 68 people. The sample in this study were pregnant women chosen by using the purposive sampling technique. The sample was divided into two groups, intervention and control groups. The intervention group that was given education on knowledge signs with the Mattampu application, about 26 samples and the control group was only given education with the MCH (Maternal and Child Health) book, about 26 people. The inclusion criteria of mothers were pregnant women in the BojoBaru Community Health Center's working area -Barru Regency could read and write and had androids. The exclusion criteria of mothers were pregnant women who had complications/problems in pregnancy.

Data Collection
The data collection instruments used in this study were an Android-based smartphone, the Mattampu application developed, an informed consent sheet, and a questionnaire to measure the mother's level of knowledge.

Data Analysis
To analyse the differences in pre and post mothers' knowledge in both the intervention and control groups using the Wilcoxon test. Also, analyse the differences in mothers' level of knowledge between the intervention and control groups using the Mann-Whitney test.

III. RESULT

A. Analysis Univariate
Univariate analysis was conducted to determine the respondent's data characteristics: age, education, and occupation. The data obtained are as presented in the following table (Table 1):

<table>
<thead>
<tr>
<th>Variables</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 26</td>
<td>N = 26</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 19 years</td>
<td>5</td>
<td>19.2</td>
</tr>
<tr>
<td>20 – 35 years</td>
<td>21</td>
<td>80.8</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>25</td>
<td>96.2</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>3.8</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not working</td>
<td>22</td>
<td>84.6</td>
</tr>
<tr>
<td>Working</td>
<td>4</td>
<td>15.4</td>
</tr>
</tbody>
</table>
Table 1 shows that most respondents in the intervention group aged 20–35 were 21 people (80.8%). In the control group, there were 23 people (88.5%). The majority of respondents’ education in the intervention and control group was low educated (elementary-high schools) as many as 25 people (96.3%). The majority of the intervention and control groups were not working, as many as 22 people (84.6%).

Table 2. The Relationship Between Respondent Characteristics and The Level of Maternal Knowledge

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack</td>
<td>Adequate</td>
<td>Good</td>
</tr>
<tr>
<td>Age ≤ 19 years</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>20 – 35 years</td>
<td>23</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not working</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>Working</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<sup>a</sup>Chi-Square test

Table 2 shows that all respondents aged ≤ 19 years had less knowledge, as many as eight respondents (100%). Meanwhile, of the 44 respondents aged 20–35 years, 23 respondents (52%) had a low level of knowledge. The analysis results showed α <0.05, so there was a relationship between age and maternal knowledge level before the intervention period.

The 50 respondents with low education (elementary-high schools). There were 31 respondents (62%) who had a low level of knowledge. Of the two respondents who were highly educated (>Diploma), there was one respondent (50%) with good knowledge. The analysis results show that α <0.05, so there was a relationship between education and maternal knowledge level before the intervention period.

The 44 respondents who did not work were 28 respondents (63.6%) had a low level of knowledge. The eight respondents who worked were four respondents (50%) who had a sufficient knowledge level. The analysis results show that α > 0.05 showed no relationship between work and maternal knowledge level after the intervention period.

B. Bivariate Analysis

Table 3. Maternal Knowledge Before and After Application of Pregnancy Danger Signs Educational Media to the Intervention Group and the Control Group

<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>Knowledge Level</th>
<th>Average Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lack</td>
<td>Adequate</td>
<td>Good</td>
</tr>
<tr>
<td>Pre Test</td>
<td>16</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>(61.5%)</td>
<td>(34.6%)</td>
<td>(3.8%)</td>
<td></td>
</tr>
<tr>
<td>Post Test</td>
<td>-</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>(19.2%)</td>
<td>(80.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Test</td>
<td>15</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>(57.6%)</td>
<td>(34.6%)</td>
<td>(7.6%)</td>
<td></td>
</tr>
<tr>
<td>Post Test</td>
<td>13</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>(50%)</td>
<td>(38.4%)</td>
<td>(11.5%)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Wilcoxon test
Based on table 3, pregnant women with good knowledge during the pre-test were one person (3.8%). After being given educational media intervention of the danger signs of pregnancy with the Mattampu application, it increased to be good, about 21 people (80.7%).

The analysis results in table 5 show the value of the pre-test and post-test results in the intervention group. The average value of knowledge in the pre-test was 51.1%. After the intervention, the application, the knowledge of pregnant women increased by 27.1%, became 78.2%, with a value (p = 0.000 <0.05). It means there was a significant influence on the respondent’s knowledge after education is given in the Mattampu application form.

Based on table 3, there were two pregnant women with good knowledge (7.6%), and the most were pregnant women who had poor knowledge at the time of the pre-test, 15 people (57.6%). After the post-test, mothers with good knowledge amounted to 3 people (11.5%), and those with less knowledge were 13 people (50%).

The analysis results in table 6 show the value of the pre-test and post-test results in the control group. About 26 respondents with an average value of 48% and after the intervention, pregnant women's knowledge increased by 18.6% to 66.6%, with a value (p = 0.083 > 0.05). It means there was no significant effect on the knowledge of respondents who are not given intervention with the Mattampu application during the intervention period.

The results of increasing maternal knowledge before and after the intervention period in the Intervention and Control groups can be seen in the following graph (Figure 1):

![Figure 1. Knowledge Levels of the Intervention and Control Groups at Pretest and Postest](image)

**Table 4. Differences in Mother's Knowledge Level Before and After Intervention Period in the Intervention and Control Groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>Level of Knowledge Before Intervention</th>
<th>Level of Knowledge After Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean Rank</td>
</tr>
<tr>
<td>Control</td>
<td>26</td>
<td>25.23</td>
</tr>
<tr>
<td>Intervention</td>
<td>26</td>
<td>27.77</td>
</tr>
</tbody>
</table>

*Mann-Whitney test

Based on table 4, it can be seen that the p-value = 0.542 (α> 0.05). The mean rank of the control group's knowledge level was 25.23, smaller than the mean rank of knowledge in the intervention group of 27.77. Thus, no difference in knowledge in the control group and the intervention group before being given education on pregnancy danger signs with the "Mattampu" application.

Based on table 4, it can be seen that the p-value = 0.000 (α<0.05). The mean rank of the level of knowledge in the intervention group was 15.58, smaller than the mean rank of the level of knowledge in the control group of 37.42. Thus, there were differences in knowledge in the control group and the intervention group after being given education on the danger signs of pregnancy with the Mattampu application.
IV. DISCUSSION

A. Univariate Analysis

Age is the age of an individual that is counted from the time of birth to the birthday. The elder enough, the level of maturity and strength of a person will be more mature in thinking and working. Based on table 2, the results show that of the 44 respondents aged 20 - 35 years, 23 people (52%) had less knowledge about danger signs during the pregnancy process. The analysis found a relationship between age and the level of maternal knowledge (0.05).

Following the theory from Notoatmodjo (2012), information is one factor that can affect a person's knowledge. It may be due to the information about pregnancy danger signs that have been obtained in the educational media application.

One's education influences knowledge. Education can influence behaviour to motivate oneself so that it can play a role in health development. The frequency test showed there were the majority of respondents with low education (elementary-high schools), the intervention group was 25 people (96.2%), and in the control group was 25 people (96.2%). After the analysis, the two groups after the intervention period were obtained from 50 respondents with inadequate knowledge: 31 respondents were mainly less knowledgeable (62%), with results $\alpha < 0.05$. It was indicating a relationship between education and someone's knowledge. It is consistent with the many studies on maternal education, the level of knowledge about danger signs during pregnancy that a person's education level affects the level of knowledge (Agunwa et al., 2015; Kabakyenga et al., 2011; Okour et al., 2012).

A person with low education does not mean insufficient knowledge. An increase in knowledge is not obtained in a formal school. However, it can also be obtained in non-formal education.

The type of work affects a person having free time to participate in the environment or formal education. The work environment can make a person gain experience and knowledge either directly or indirectly, an experience which is also a part that can affect the level of knowledge.

Based on the study results, most mothers who were given the intervention did not work, about 22 people (86.6%). The same as in the control group, the majority of mothers who did not work (44 respondents (86.6%)) and 28 respondents (63.6%) had a low level of knowledge. The analysis results show that $\alpha > 0.05$, so it can be concluded that there was no relationship between work and the level of maternal knowledge.

Our finding is following research conducted by Agustini in 2012 which states that there is no relationship between the mother's work status and the level of knowledge of pregnant women. Also, with a person who will have less time to seek or obtain information, the mother's knowledge will be less. Many other factors affect the mother's knowledge, apart from age and education level, that can influence pregnant women about the knowledge of pregnancy danger signs.

B. Bivariate Analysis

1. The effect of an educational media applications "Mattampu" on the level of knowledge of mothers in the intervention group

Changes in maternal knowledge level before the intervention and after the intervention in the intervention group increased the level of knowledge after being given education on the danger signs of pregnancy with the "Mattampu" application with a $P$ value $<0.05$.

This study's results follow the research conducted by Hikmawati et al. (2020) regarding the Comparison of the Android-Based Smart Continuity Of Care Application (MONSCA) and the MCH Handbook on Increasing Knowledge of Pregnant Women in Handling Pregnancy Risk Factors. Hikmawati et al. said that the knowledge of pregnant women who were given education in the MONSCA application experienced a significant increase ($p = 0.007$).

A study (You et al., 2012) on "Improving patient understanding of preeclampsia. The study with a randomised controlled trial" shows that the use of media in educating mothers about preeclampsia increased by 8% and 22%
The effect of the Mattampu application is more influential on the level of maternal knowledge, than mothers who do not use the Mattampu application as an educational media for pregnancy danger signs. This Mattampu application is designed as interesting as possible to make the reader not get bored quickly. According to Notoatmodjo (2012), much-learned information can affect an individual's knowledge and increasing this knowledge creates awareness. It will eventually behave following the knowledge that is already owned.

According to our assumptions, the "Mattampu" application affected the mother knowledge level about pregnancy dangers. Mothers who use the "Mattampu" application in educating pregnancy danger signs have a higher level of knowledge than mothers who do not use the "Mattampu" application.

2. The effect of a MCH book education on the level of knowledge of mothers in the control group

Changes in the level of knowledge before the intervention and after the intervention in the control group who were given conventional care with the MCH book increased knowledge after the intervention period with a P value> 0.05. The Wilcoxon test in the control group showed that p = 0.008 was greater than α = 0.05. Thus, no difference in the level of knowledge before the intervention and after the intervention in the control group.

According to Edgar Dale, media use in learning uses the Cone Experience principle. Learning media are needed, such as textbooks, learning tools made by instructors, and audiovisuals. Other sources say that the media's visual understanding is better than verbally (Susilowati, 2016). The use of the MCH book in Indonesia is an effort to ensure mothers and children's health and ensure their sustainability (Bhuiyan SU, 2009).

A study conducted by (Casazza&Ciccazzo, 2007) showed that computer-based educational media increased people's knowledge of nutrition and physical activity by 13%, while traditional interventions only increased knowledge by 8%. In line with this knowledge, in this study, the use of android-based educational media applications significantly increased maternal knowledge by 27%. It can also be related to the type of educational media intervention used.

During this research, 80% of respondents said that they never opened the MCH booklet within 2 weeks of this research. Meanwhile, 20% of respondents did not know where they put their KIA booklet. Unlike the case with books, the Mattampu application is available on mobile phones that can be carried anywhere. It is different with the KIA book, which they cannot carry anywhere while traveling. With the increase in smartphone users and easy access to information via mobile applications, it is concluded that these interventions affect the knowledge an individual gets and can help mothers maintain health, manage individual conditions, and take precautions. (Whitehead & Seaton, 2016)

3. Differences in Mother's Knowledge Level in the Intervention Group and the Control Group

"Mattampu" Educational Media applications affect maternal knowledge level by proving that there is a difference in the average level of maternal knowledge. It can be seen that the level of maternal knowledge after the intervention period in the group given danger sign education with the "mattampu" application was 15.58 lower than the control group after the intervention period with a value of 37.42. From the Mann Whitney test, significant differences found in the level of knowledge after the intervention between the intervention group and the control group with a value of P = 0.000 (α <0.05).

According to NasruddinSafaat H (2012), Android is an operating system on mobile phones that is open and based on the Linux operating system. Android can be used by anyone who wants to use it on their device. Istiyanto (2013) explains the factors that cause Android applications' popularity, namely the speed factor, where the application's efficiency in providing data is precisely what the user wants.

Respondents who used Mattampu as a medium for education on pregnancy danger signs showed an increase in their level of knowledge. This is because this application has been created very efficiently so that users can use this application easily. Mobile applications are made simple for specific needs to easily and quickly access the data they need. The results obtained, where the media application android can increase the number of pregnant
women who have good knowledge of pregnancy exercise. This situation is following Utami’s (2016) research on HIV / AIDS education using android application media to 143 students in Jakarta. The increased student knowledge about how HIV / AIDS is transmitted by 25.87%.

Health information, especially about the danger signs of pregnancy, has been easy to obtain, not only from health workers but nowadays, many mass media have facilitated and provided detailed education information on pregnancy. (Assaf, 2018; Vijay et al., 2015)

"Mattampu" educational media application is an Android-based application. Educational media displays an attractive design, and the information presented, and text and images that are simple and easy to understand. This educational media application is easy to use and understand following the available instructions for use. The advantage of Mattampu is that this application can be operated offline so that consumers who do not have an internet network can still use this application. It is following the research conducted by Hasjiandito (2014) that blended learning-based learning can increase knowledge. So, the android application on adolescent reproductive health is practical and can be used for disseminating information. As a health promotion media, it can help observe, recognise, and remember because it is a fun and visual learning medium.

V. CONCLUSIONS AND SUGGESTIONS

The influence of the "Mattampu" application on the increase in the level of maternal knowledge about the danger signs of pregnancy in the intervention group (p = 0.000 <0.05). There was a significant difference in the level of knowledge after intervention in the two groups (p = 0.000 <0.05)

The "Mattampu" application can be further refined by adding content according to pregnant women’s needs for childbirth and presenting a forum menu. So, the fellow pregnant women or parents can share experiences. To make it more interesting, it may add audiostreaming features such as Murottal.

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