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"MAMA" mobile application for pregnancy knowledge and anxiety: A quasi-experimental study

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ABSTRACT

Introduction: Pregnancy is a critical phase in a woman's life that induces a range of alterations, including physical, emotional, and social changes. Prenatal anxiety, often known as anxiety during pregnancy, is a prevalent psychological illness that frequently manifests throughout the gestation period. Knowledge is an indicator of anxiety levels throughout pregnancy. The objective of this study was to assess the impact of implementing the MAMA mobile application intervention on the level of awareness and anxiety related to pregnancy among pregnant women.

Methods: This study employed a quasi-experimental design, which included a pretest and posttest, along with a control group that was not equivalent to the experimental group. This study followed a quantitative method and was conducted at two community health centres in the Sleman, Yogyakarta area for the control group and intervention group. We conducted the research from December 2019 to March 2020. The participants in this study were exclusively third-semester pregnant women who received care at community health centres and matched the specified research requirements. The sample size for each group consisted of 39 respondents. This study included a knowledge questionnaire to assess pregnancy knowledge and the HRSA questionnaire to assess pregnancy anxiety.

Results: The research results indicate a significant impact on the knowledge variable in the intervention group before and after they received the MAMA mobile application (p=0.000). In addition, the intervention group experienced an influence on the anxiety variable before and after receiving the MAMA mobile application (p=0.018).

Conclusion: The mean difference test comparing the control group to the MAMA mobile application group revealed a significant impact of the application on pregnant knowledge. However, we observed no significant effect on pregnancy anxiety.

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INTRODUCTION

Pregnancy is a critical phase in a woman's life that induces a range of alterations, including physical, emotional, and social changes.[1] The multitude of changes that occur during pregnancy makes it a susceptible period for women to suffer from psychological or mental illnesses.[2] Psychopathological conditions that may arise encompass sadness, anxiety, and even episodes of depression.[3]

Anxiety during pregnancy, or prenatal anxiety, is a psychological disorder that commonly occurs during pregnancy.[4,5] A meta-analysis study revealed that around 12.5% of pregnant women suffer from anxiety disorders. The estimated clinical prevalence of anxiety disorders during pregnancy is 18.0% in the first trimester, 15.2% in the second trimester, and 15.4% in the third trimester.[2] Currently, there is a lack of national data on anxiety disorders during pregnancy in Indonesia. However, there have been numerous studies conducted on this topic. One study that was previously conducted in the Bandung region, Indonesia, stated that as many as 43.3% of pregnant women experienced mild levels of anxiety, 43.3% moderate levels of anxiety, and 13.4% severe levels of anxiety.[6] Anxiety during pregnancy can have serious impacts, such as increasing heart rate and blood pressure, resulting in reduced blood supply to the placenta and fetal distress. In addition, anxiety experienced during pregnancy can lead to premature birth, the birth of newborns with low birth weight. It can have an impact on the cognitive, emotional, and neurological development of the baby.[7]

Knowledge is an indicator of anxiety levels throughout pregnancy. Previous research stated that pregnant women who have low knowledge scores are more at risk of experiencing anxiety during pregnancy.[8] Studies revealed that providing information on anxiety throughout the

period of pregnancy and delivery can effectively lower anxiety levels. However, once the education is stopped, the positive effects progressively diminish, and anxiety starts to resurge.[9]

Mobile applications have been created to address healthcare needs on a global scale. The American College of Obstetricians and Gynecologists (ACOG) has also recommended the use of mobile apps to provide health education related to prenatal and postpartum care.[10] Mobile applications can be an effective intervention in preventing anxiety during pregnancy.[11]

Based on the results of a preliminary study conducted on 10 pregnant women at one of the community health centres in the Sleman region, Yogyakarta, data were obtained that two of the pregnant women experienced anxiety during pregnancy, with signs including feelings of anxiety, tension, sleep disturbances, symptoms of anxiety in the muscles, and gastrointestinal disorders such as nausea and vomiting. Hence, the objective of this study was to ascertain the impact of implementing the Mobile Application for Mother's Adaptation (MAMA) intervention on the levels of knowledge and anxiety pertaining to pregnancy among expectant women.

METHOD

This research has received ethical clearance from the Medical and Health Research Ethics Committee (MHREC) of the Faculty of Medicine, Public Health and Nursing, Gadjah Mada University. Next, we submitted the ethical clearance permit (Ref. No: KE/FK/1243/EC/2019). This study used a quasi-experimental design that included a pretest and post-test, as well as a control group that was not equivalent to the experimental group. We conducted this research by providing an intervention to pregnant women via the "MAMA" mobile application to the intervention group. We conducted this research at two community health centres in the Sleman area, Yogyakarta, for the control group and intervention group, from December 2019 to March 2020. The participants in this study were only pregnant women in their third trimester who were receiving care at community health centres and met the specific criteria for research participation. The research sample selection employed a consecutive sampling method.

The research sample calculation yielded 35 respondents for each group. We anticipated a dropout rate of 10% among the 35 initial replies in this research, which led to a final sample size of 39 participants for both the intervention group and the control group. The study's inclusion criteria included pregnant women in the third trimester who had a KIA book, had an Android-based smartphone and were able to operate it, could read and speak Indonesian, and were willing to be research respondents.

We developed a questionnaire in collaboration with experts to assess knowledge related to pregnancy. The knowledge questionnaire about pregnancy was created and tested for validity using biserial correlation with a total score of 0.22, and a reliability test using the KR-20 with an r-value of 0.589. The questionnaire consisted of 15 multiple-choice questions about pregnancy, each with three answer choices, scored from 0 to 1. A correct response was assigned a score of 1, while an incorrect answer was assigned a score of 0. The questionnaire applied in this research to measure anxiety was the Hamilton Rating Scale Anxiety (HRSA) questionnaire, which was previously used in a research[12]. This questionnaire consisted of 37 questions covering 13 groups of anxiety symptoms. The scores in this study applied a Likert scale with a range of 1-4; 1=never, 2=rarely, 3=often, 4=always. The validity test of the anxiety instrument was carried out using the Pearson Correlation Product-Moment statistical method, with a total score of 0.361. The reliability test for the anxiety instrument employed Cronbach's Alpha with an r-value of 0.958.

Mobile Application for Mother's Adaptation (MAMA) is a mobile application-based health education media employed in this research, created by the researchers. The MAMA application contains materials about pregnancy knowledge, stress during pregnancy, anxiety during pregnancy, and childbirth. In addition, the MAMA application also contains image displays and quizzes for each material, which can increase pregnant women's understanding of the existing material.

The gathered research data were subjected to univariate analysis for demographic data and bivariate analysis to assess the impact of the MAMA mobile application on knowledge enhancement and anxiety reduction in pregnant women. Bivariate analysis was conducted to examine the difference in mean scores before and after the intervention using the MAMA mobile application, as well as to compare the results between the intervention and control groups. The data analyzed consisted of the differences in scores before and after the intervention, with a 95% confidence level. The differences in knowledge scores were analyzed using the Wilcoxon signed-rank test because the data were not normally distributed. In contrast, anxiety scores were analyzed using a paired t-test since the data were normally distributed, with a significance level of 0.05. To compare the control and intervention groups, the Mann-Whitney test was used for knowledge data due to its non-normal distribution, and the independent t-test was applied for anxiety data, which followed a normal distribution. Before data collection was carried out, we explained the objectives, procedures, and benefits of the research, respondents' rights, and confidentiality of identity given to respondents, and asked respondents to sign a letter of consent to become respondents (Informed Consent).

RESULT

The respondents in this study were pregnant women who underwent pregnancy checks in the period December 2019 to March 2020 at two community health centres in the Sleman area, Yogyakarta. A detailed description of the respondents in this study can be seen in Table 1.

By comparing the initial and final levels of knowledge in the intervention group, which used the MAMA application, with the control group, which only received ANC services, we could assess the impact of using the MAMA application on knowledge and anxiety. According to the data in Table 2, there is a noticeable disparity in knowledge between the intervention group, with a p-value of less than 0.05 indicating statistical significance.

Table 1. Respondents' characteristics

Respondents' Characteristics	Intervention Group (N = 39)			Control Group (N = 39)			p-value (CI 95%)
	f	%	Mean±SD	f	%	Mean±SD	
Age (years)			28,67±6,28			28,74±5,12	0,759
<20	1	2,6		0	0,0		
20 – 35	30	76,9		32	82,1		
>35	8	20,5		7	17,9		
Education							0,258
Did not complete school	0	0,0		0	0,0		
Elementary School	0	0,0		1	2,6		
Junior High School	3	7,7		12	5,1		
Senior High School	25	64,1		18	46,2		
Higher Education	11	28,2		18	46,2		
Occupation							0,163
Employed	18	46,2		12	30,8		
Unemployed	21	53,8		27	69,2		
Access to pregnancy information							0,202
Friends or family	0	0,0		1	2,6		
Print media	0	0,0		0	0,0		
Internet	6	15,4		2	5,1		
Healthcare professionals	3	7,7		7	17,9		
More than one source	30	76,9		29	74,4		
Experience in attending health education							0,082
Has attended	8	20,5		15	38,5		
Has never attended	31	79,5		24	61,5		
Gravidity							0,488
Primigravida	17	43,6		14	35,9		
Multigravida	22	56,4		25	64,1		
Parity							0,781
Nullipara	16	41,0		13	33,3		
Primipara	15	38,5		17	43,6		
Multipara	8	20,5		9	23,1		
Grandemultipara	0	0,0		0	0,0		
Number of pregnancy checkups							0,104
<4x	8	20,5		3	7,7		
≥4x	31	79,5		36	92,3		
Miscarriage (Abortion)							0,498
Never had	33	84,6		35	89,7		
Has had	6	15,4		4	10,3		

Table 2. Differences in pretest-posttest knowledge between the two groups

Group	Variable	Median (Minimum-Maximum)	p-value (CI 95%)
Intervention	Knowledge pretest	11 (2 – 15)	0,000*
	Knowledge posttest	13 (5 – 15)	
Control	Knowledge pretest	11 (5 – 14)	0,056
	Knowledge posttest	12 (6 – 15)	

*Significant ($p < 0.05$)

Table 3. Differences in pretest-posttest anxiety between the two groups

Group	Variable	Mean ± Std. Dev	p-value (CI 95%)
Intervention	Anxiety pretest	70,10 ± 13,42	0,018*
	Anxiety posttest	73,18 ± 13,69	
Control	Anxiety pretest	74,69 ± 13,64	0,151
	Anxiety posttest	76,97 ± 11,76	

*Significant ($p < 0.05$)

Table 4. Difference in pretest-posttest scores for knowledge and anxiety in the intervention and control groups

Variable	Group		p-value (CI 95%)
	Intervention	Control	
Δ Knowledge	2 (-3-8)	1 (-5-5)	0,029*
Δ Anxiety	2 (-10-19)	3 (-23-18)	0,692

*Significant ($p < 0.05$)

In the results of the difference test, it can be seen that in the intervention group between the pretest and posttest, there was an increase in median, an increase in average knowledge, an increase in standard deviation, and a significant difference in test scores. This demonstrates the impact of the MAMA application on pregnant women's level of pregnancy knowledge.

Table 3 shows a notable disparity in anxiety levels within the intervention group, with a p-value of less than 0.05. The results of the different test values show that in the intervention group, there are significantly different test values between the pretest and post-test. In the control group, there was no significant difference in anxiety (p-value > 0.005). However, in both the control and intervention groups, there was an increase in the average level of anxiety.

Table 4 displays the statistical outcomes of assessing the disparities in pretest-posttest knowledge and anxiety levels between the intervention and control groups.

The statistical tests conducted on the pretest-posttest knowledge and anxiety scores of the intervention and control groups revealed that there was a significant increase in knowledge scores ($p = 0.029$, 95% CI), while there was no significant difference in anxiety scores ($p = 0.692$, 95% CI).

DISCUSSION

In this study, in the intervention group given the MAMA mobile application, there was a significant effect on the knowledge variable after the intervention was provided. These results are in line with the previous research[13], which stated that the use of smartphone applications that contain health education during pregnancy can increase information and can also support lifestyle modifications during pregnancy. Previous research[14] demonstrated the enhancement of pregnant women's knowledge, particularly regarding pre-eclampsia, through the use of mobile-based educational applications. The intervention group observed a substantial 63% rise in the average knowledge score following the implementation of the intervention. Accordingly, another research also revealed that smartphone application-based health education can effectively increase women's knowledge about lifestyle during pregnancy, thus improving antenatal care for the better and reducing risks that can occur during pregnancy.[15]

Furthermore, the findings in this study revealed that there was an influence on the anxiety variable in the intervention group after 14 days of implementing the intervention. However, in both the intervention and control groups, there was an increase in the average anxiety score. Based on the previous research,[16] many factors can influence the results of health education for pregnant women, especially the sociodemographic characteristics of pregnant women. The increase in anxiety scores in both groups could be caused by other sociodemographic factors not discussed in this study, such as income, husband's support, and fear of childbirth. Previous research stated that the lower the support received from the husband, the higher the fear of giving birth will be experienced.[17] Partner support is an essential resource for women during pregnancy, as their family members and friends from before marriage may not be readily available in their new homes after getting married.[18] Elevated levels of anxiety in the third trimester of pregnancy may be associated with labour anticipation, as this phase poses significant challenges for women due to the imminent delivery. The fear associated with the approaching birth can intensify, even though some level of anxiety is expected throughout pregnancy. This heightened fear can affect the pregnant woman's psychological well-being, as research indicates that women who fear childbirth are at a higher risk of developing anxiety during pregnancy.[19] However, this study did not further analyse the factors that influence anxiety in respondents.

Based on the findings of this study, health education through the MAMA application media has a significant difference in the knowledge variable, and there is no significant difference in the anxiety variable. The increase in knowledge that occurred could be obtained from previous pregnancy experiences because the majority of mothers in the intervention group were multigravida mothers. The respondent's pregnancy knowledge is a combination of previously obtained pregnancy information and experience. This is in line with the previous research[20] which suggested that previous pregnancy experience influences the level of knowledge of pregnant women. Smartphone applications are applications that are popular among the public, including for pregnant women, making it easier for mothers to get information related to pregnancy, such as danger signs of pregnancy and preparation for becoming mothers, which will ultimately increase pregnant women's knowledge.[21]

There are several factors that influence the effectiveness of interventions, primarily through mobile applications. These factors include the application's content being interactive and providing professional consultation, and the application having reminder and information features that are pretty relevant to the material provided.[21] In addition, there was an increase in the average anxiety score in both the intervention group and the control group because in the 14 days between the pretest and post-test, the mother received additional stressors, which could increase the mother's anxiety without any control or intervention from the researcher.

According to the previous discussion, it is necessary to familiarize users with the material in the application before they can use it. In addition, the application should

have extra features such as counselling and practice videos. Furthermore, a more extended intervention period is required in order to reduce anxiety effectively. Lastly, additional analysis can be carried out regarding external factors that might influence anxiety during pregnancy so that the interventions provided can be more appropriate and effective.

CONCLUSION

Based on the research findings and discussion, it can be concluded that the MAMA mobile application has an influence on pregnancy knowledge. However, the MAMA mobile application has no effect on pregnancy anxiety.

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Nil.

CONFLICT OF INTERESTS

The authors declare there is no conflict of interest.

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AUTHOR CONTRIBUTION

DCN conducted literary research, carried out data analysis, statistical analysis, manuscript preparation, and manuscript review, and acted as a guarantor. DCN, WW, and WL conceived the design of the study, definition of intellectual content, experimental studies, and data acquisition. All authors edited and reviewed the manuscripts.

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