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The Effect of Using the *Ebumil* Android Application on Knowledge and Independence of Pregnant Women about Pregnancy Care

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ABSTRACT

OBJECTIVE: This study aimed to analyze the effect of using the *Ebumil* Android application on the Independence and knowledge of pregnant women regarding pregnancy care.

METHODOLOGY: This study employed a quasi-experimental design to investigate pregnant women at four Community Health Centres in Kendari City, spanning from April to October 2024. The study involved 120 pregnant women divided into two groups: those who were given an online application and those who received leaflets, using a simple random sampling technique. The study used the Friedman statistical test.

RESULTS: The study found that the Intervention led to a significant increase in knowledge among the respondents compared to the control group. The intervention group showed a slight increase in knowledge at the second post, whereas the control group showed no growth. The p-value was < 0.05. The study found that online applications significantly increased knowledge about pregnancy care, with a faster increase in Independence compared to leaflets and a significant effect on the intervention and control groups ($p = 0.000$ for both knowledge and Level of Independence).

CONCLUSION: *Ebumil* application can improve knowledge and level of Independence better than conventional leaflets.

KEYWORDS: *Ebumil,* knowledge, Independence, pregnant, women, care

INTRODUCTION

The leading cause of maternal death is complications during pregnancy and childbirth. The global maternal mortality ratio decreased by 34% between 2000 and 2020. The decrease was recorded at 34%, or from 339 deaths to 223 deaths per 100,000 live births. This indicates an average reduction of 2.1%. While this is very important, this decrease represents only one-third of the annual rate of 6.4 per cent required by the SDGs (70 maternal deaths per 100,000 live births)[1].

Systemic, sociocultural, and racial and ethnic health factors adversely affect maternal outcomes, such as maternal mortality during childbirth or the postpartum period. Previous research has shown that Black women living in the United States have higher rates of maternal mortality and morbidity[2]. The impact of these disparities is compounded by systemic barriers involving the quality and access of health services, economic resources and the quality of health services. These three factors influence how people use health services during pregnancy[3].

Several factors that can worsen pregnancy conditions include exposure to pollutants, psychological conditions and environmental stress[4]. The risk of pregnancy complications also increases as geographic and financial barriers to pregnancy for pregnant women and their families increase[5]. A holistic approach that considers social determinants of health and the accessibility and quality of maternal care for all women could be a way to address these multiple disparities[6].

The implementation of mobile applications, such as Android applications, plays a crucial role in increasing the Independence and knowledge of pregnant women in pregnancy care. Mobile applications have been proven to significantly improve understanding of pregnancy-related health. Previous studies have demonstrated that interventions supported by technology can provide more effective education on prenatal concepts and enhance maternal confidence. This has an impact on optimal pregnancy outcomes[7].

Moreover, systematic reviews indicate that various mobile health tools, including educational apps, effectively promote health literacy among pregnant women, encouraging them to engage in self-care practices and make informed decisions about their health[8]. The *Ebumil* application, like others, empowers women by providing tailored information that caters to their unique health needs, thus fostering Independence in managing their pregnancy[9]. This aligns with findings that demonstrate the positive impact of mobile health interventions on both knowledge acquisition and health outcomes among pregnant women[10].

Ebumil is a mobile application specifically designed to support pregnant women in managing their pregnancy care. The application provides information and tips tailored based on the user's gestational age, addressing different stages of pregnancy-specific health issues. *Ebumil* offers tools to track health metrics such as weight gain, appointments, and symptoms, allowing users to keep a log of their health journey; users have access to a wealth of educational materials, including articles and videos on prenatal health, nutrition, and childbirth preparation, aimed at increasing knowledge and Independence in pregnancy care, The application includes reminder functions for medications, appointments, and prenatal exercises, promoting proactive health management, *Ebumil* encourages user interaction through community features, allowing pregnant women to connect and share experiences, thereby increasing social support during pregnancy.

This study aimed to analyze the effect of using the *Ebumil* Android application on the Independence and knowledge of pregnant women regarding pregnancy care. The study will involve collecting data from pregnant women who have used the application and comparing their understanding and level of Independence in pregnancy care with those who have not. This study provides valuable insights into the efficacy of Ebumil in empowering pregnant women to manage their health effectively.

METHODOLOGY

Design

This study used a quasi-experimental approach. This study was conducted among pregnant women at four community health centres in Kendari City from April to October 2024.

Sampling

The determination of the number of samples is calculated using the Slovin formula. This formula is used because it enables the determination of the correct number of samples in a known population. In addition, this formula provides sufficient data to meet the needs and maintains a balance between analysis and time and resource constraints, especially in public health research settings. The result of the calculation was 120 samples, which were then divided equally between the control and intervention groups. The intervention group (who were given the online application) included 60 pregnant women, and the control group (who were given leaflets) included 60 pregnant women. A simple random sampling technique was used, with the inclusion criteria being pregnant women who live in coastal and Island areas, own an Android-based smartphone, and are able to operate it.

To ensure that participants can effectively use the online application, inclusion criteria were applied to exclude unsuitable participants. The selected participants were then randomized into two groups: the control and Intervention groups, after obtaining written and verbal approval for ethical reasons.

Collecting and data analysis

The selected respondents took a pre-test before being given the application and leaflet and were accompanied by researchers for one week. After this period, the post-test was administered twice. The first post-test was conducted one month after the Intervention was administered, and the second post-test was conducted two months after the Intervention. The data analysis was divided into univariate and bivariate analyses. Univariate analysis was used to describe the number of variables in percentage form. This data analysis was presented in the form of a frequency distribution of age, education, employment, income, weight, height, upper arm circumference, gravidity, number of children, contraception used before pregnancy, knowledge about pregnancy care, and Independence in pregnancy care before and after the Intervention. Bivariate analysis was used to determine the level of difference before and after the Intervention was given, specifically in the control group and the intervention group, so that the effect of providing an online-based application *Ebumil* https://play.google.com,/store/apps/details?id=com.edubumilrn&pli=1 and leaflets on knowledge and level of Independence could be assessed. The Friedman statistical test was employed for the analysis, which is the test used in this study. Data processing utilized computerized statistics at a 95% confidence level ($\alpha = 0.05$). The Friedman Test was chosen because of its suitability in analyzing repeated measurements in the same subject (non-parametric conditions)

Ethical Permission

This research has received research ethics permission from the Ethical Commission of STIKES Nani Hasanuddin (No: 126/04/2024/ Komite Etik/ Stikes Nani Hasanuddin). The participants in this study provided informed consent both verbally and in writing before their participation. All collected data will be kept confidential and used solely for research purposes.

Research protocol

The initial step for researchers is to register their study online at https://simlitabkes.kemkes.go.id/Login.aspx with the Indonesian Ministry of Health, which has since received the ministry's approval under number 5011.DDC.001.421123. Coordination with the relevant parties (four community health centres) was the next stage. The researcher planned to contact each individual to be studied at the community health centre after obtaining consent from the four community health centres and searching for secondary data on potential research subjects. Organizational Measurements and Interventions. Once completed, the researcher entered the measurement data into the SPSS program.

Test the validity of the questionnaire.

The questionnaire disseminated by the Ministry of Health of the Republic of Indonesia served as the model for the research questionnaire. The Pearson product-moment analysis test was then used to determine the validity of the questionnaire. Every question that was submitted had a value greater than 0.3, according to the test findings. The dependability of the instrument was tested using Cronbach's alpha. With a Cronbach's alpha score of 0.946 or higher in the reliability test findings, it is possible to say that the variable is consistent and reliable in measurement.

RESULTS

The study found (**Table I**) that the majority of respondents in both the intervention and control groups were 20-35 years old, with high school being the highest level of education. Most respondents were non-working, with the highest weight according to gestational age. The highest body height was ≥145 cm, whereas the highest upper arm circumference was <23.5 cm. The highest gravidity was observed in the multiparous group, with 25 (41.7%) in the intervention group and 27 (45.0%) in the control group. The most common contraception used before pregnancy was injections.

Table I: Demographic Characteristics of Respondents in the Intervention and Control Groups

Respondent Characteristics	Intervention Group		Control Group		Homogenity
	n	%	n	%	
Age					0.754
<20 years	20	33.3	18	30.0	
20-35 years	30	50.0	28	46.7	
>35 years	10	16.7	14	23.3	
Education					0.814
Elementary	10	16.7	12	20.0	
Junior high school	15	25.0	14	23.3	
Senior high school	28	46.7	25	41.7	
University	7	11.7	9	15..0	
Status					0.517
Work	17	28.3	19	31.7	
Not work	43	71.7	41	68.3	
Weight					0.624
Appropriate for gestational age	31	51.7	29	48.3	
Not Appropriate for Gestational Age	29	48.3	31	51.7	
Height					0.617
≥145 cm	47	78.3	45	75.0	
<145 cm	13	21.7	15	25.0	
Upper arm circumference					0.514
<23,5 cm	33	55.0	31	51.7	
≥23,5 cm	27	45.0	29	48.3	
Gravidity					0.844
Primipara	22	36.7	20	33.3	
Multiparous	25	41.7	27	45.0	
Grande Multipara	13	21.7	13	21.7	
Number of children					0.732
0	20	33.3	21	35.0	
1	9	15.0	9	15.0	
2	10	16.7	12	20.0	
3	9	15.0	10	16.7	

≥4	12	20.0	8	13.3	
Contraception Ever Used					
Pill	20	33.3	21	35.0	0.614
Inject	24	40.0	21	35.0	
IUD	10	16.7	9	15.0	
Implant	6	10.0	9	15.0	

The study found that the Intervention led to an increase in knowledge in the good category among respondents compared to the control group (**Table II**). The intervention group showed a slight increase in knowledge at the second post, whereas the control group showed no growth. The majority of respondents had no prior knowledge, with 40 (66.7%) in the intervention group and 38 (63.3%) in the control group. The intervention group had the highest knowledge after one month (post 1) and two months (post 2), with 50 people (83.3%) and 12 people (20.0%) in the control group. The p-value was smaller than 0.05 in both post 1 and post 2, indicating that the Intervention affected increasing knowledge and Independence.

Table II: Pregnant Women's Knowledge about Pregnancy Care Before and After Being Given Intervention

Variable	Intervention Group		Control Group		p-value
	n	%	n	%	
Respondents' Knowledge					
Pre-Intervention					
Good	8	13.3	10	16.7	0.587
Moderate	12	20.0	12	20.0	
Poor	40	66.7	38	63.3	
Post 1 Intervention					
Good	28	46.7	11	18.3	0.000
Moderate	22	26.7	12	20.0	
Poor	10	16.6	37	61.7	
Post 2 Intervention					
Good	50	83.3	12	20.0	0.000
Moderate	7	11.7	13	21.7	
Poor	3	5.0	35	28.3	
Respondent's Level of Independence					
Pre-Intervention					0.641
Independent	19	31.7	20	33.3	
Not Independent	41	68.3	40	66.7	
Post 1 Intervention					0.001
Independent	34	56.7	20	33.3	
Not Independent	26	43.3	40	66.7	
Post 2 Intervention					0.000
Independent	54	90.0	23	38.3	
Not Independent	6	10.0	37	61.7	
Friedman Test					

The study found that online applications significantly increased knowledge about pregnancy care compared with leaflets (**Table III**). Post 1, the online application group demonstrated a higher increase in knowledge compared to the leaflet group. Post 2, the online application group showed a faster increase in Independence compared to the leaflet group. The Friedman test showed a significant effect of online applications and leaflets on the intervention and control groups.

Table III: Average Knowledge and Independence at Post 1 and Post 2 in the Intervention Group and Control Group

Variable	Group	N	Post 1 Mean	Post 2 Mean	SD Post 1	SD Post 2	p-value
Knowledge	Intervention	60	81.14	91.45	12.5251	2.1287	0.000
	Control	60	39.23	32.52	13.2712	13.5157	
Level of Independence	Intervention	60	80.42	90.45	8.7451	2.9236	0.000
	Control	60	38.84	33.65	12.3890	13.1235	

Friedman Test

DISCUSSION

Analysis findings revealed that when mothers received an educational intervention utilizing the Ebumil application, there was a significant difference in the increase in maternal knowledge of pregnancy care, as well as a change in pre-test and post-test scores. The present study's findings are consistent with those of Behboudi's research, which demonstrated that mothers' decision-making and knowledge regarding the prevention of foreign body aspiration and the relief of child choking were enhanced by mobile-based education more than by other forms of instruction[11]. It has been found that mothers' understanding of appropriate neonatal care can be improved through the use of an Android smartphone application. Mothers' knowledge of preterm home care was significantly enhanced by the mHealth educational application[13]. This indicates that the use of applications to improve maternal knowledge is generally reliable. Thus, the development of mobile-based applications could be an effective solution for improving maternal expertise and skills related to childcare.

According to **Mulyani et al. (2023)** and **Utomo et al. (2024)**, online health education can impact the knowledge and behaviour of pregnant women[14,15]. The Android application is a comprehensive medium that is effective for educating pregnant women about pregnancy care[16]. The Android-based Pregnancy Information Application explains that it can be an alternative for women to obtain information about pregnancy. It provides valuable resources, including articles, videos, and tools, to support women throughout their pregnancy. The interactive features of the application make it engaging and user-friendly, expecting mothers to seek reliable information. The app allows users to track their pregnancy progress, set reminders for appointments, and connect with other pregnant women for their support and advice. Overall, the Android-based Pregnancy Information Application is a valuable tool for empowering pregnant women to make informed decisions regarding their health and well-being during pregnancy.

Knowledge is the stimulation that a person obtains through their senses, giving rise to the stimulation of attitudes and motivation[17]. The sense of sight is the most knowledge-rich channel of the human brain. Lack of knowledge about pregnancy care and lack of attention from both oneself (the pregnant mother) and her husband or family regarding needs during pregnancy are obstacles for a prospective mother during pregnancy[18]. Knowledge improvement efforts are carried out through various application media that educate individuals about pregnancy care. Health education is conducted to increase mothers' knowledge of pregnancy care[19].

Maternal Independence in prenatal care has increased significantly, according to the analysis findings. The findings of this study are consistent with prior research, which demonstrates that using pregnancy applications for Android devices can improve the health independence of mothers and children. Health problems in pregnant women will have a direct impact on the fetus they are carrying; therefore, pregnant women need Independence in carrying out pregnancy care. In carrying out pregnancy care, Independence is the ability to regulate behavior, select and guide decisions, and behavior without coercion or control from parents or supervision from other people[21,22].

The *Ebumil* application contains information about pregnancy care, which can increase the Independence of pregnant women in carrying out pregnancy care. Using an Android-based pregnancy application will make it easier for pregnant women to monitor their health independently, even when they are busy[23]. Pregnancy services refer to the medical care that pregnant women receive following the guidelines for prenatal care outlined in the Pregnancy Service Manual for Healthcare Professionals. Pregnant women must be highly aware of their health condition through various media or consult directly with a doctor or midwife[25]. Online

or web-based consultation facilities can be an alternative to help mothers conduct health consultations[26].

Some limitations that were explored and may occur include variations in respondents' understanding of technology despite their basic ability to use smartphones. This obstacle requires researchers in the field to explain this in more detail. However, after consulting with several research assistants, no significant obstacles were identified that could disrupt the research.

CONCLUSION

This study concluded that Intervention with online applications is more effective in increasing knowledge and Independence compared to conventional methods such as brochures. Before treatment, both groups had low knowledge related to prenatal care. After treatment, the group given the application-based Intervention experienced a significant increase in both knowledge and Independence. In contrast to the control group, which did not show the same increase. These findings support the hypothesis that interactive learning methods, such as online applications, play an essential role in health education during pregnancy. This study suggests the need for further development of health education instruments that utilize technology to enhance the effectiveness of information provided to pregnant women.

RECOMMENDATIONS

To significantly improve maternal health education and outcomes, integrating digital applications (*Ebumil*) into the national health service system can be a serious consideration for the government. Its comprehensive use in health service facilities can be an access to improve maternal and infant health in each region. Additionally, it is essential to educate health service providers as promoters of this application.

FUTURE RESEARCH

Future research should focus more on investigating the use of this application in diverse groups, both in rural and urban areas. Additionally, it is necessary to compare it with similar applications that have been previously studied so that the strengths and weaknesses of each application can be identified.

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AUTHOR CONTRIBUTION

Kartini K: Conception, design of the work, acquisition, analysis, interpretation of data for the work, Drafting the work or revising it critically for important intellectual content, Final approval of the version to be published, Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
Farming F: Conception, design, data acquisition, analysis, interpretation, critical revision, final approval, and accountability for the accuracy and integrity of the work, ensuring its publication.
Sabur F: Conception, design, data acquisition, analysis, interpretation, critical revision, final approval, and accountability for accuracy and integrity of the work, ensuring its publication.

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