

Development of a user-friendly mobile app for eclampsia prevention targeting preeclampsia mothers and spouses

Mamat Mamat,¹ Tukimin Sansuwito²

¹Politeknik Kesehatan Kemenkes Bandung, Bandung, Indonesia; ²Lincoln University College (LUC), Selangor, Malaysia

Abstract

The lack of knowledge, attitudes, and practice of preeclampsia mothers and spouses in preventing eclampsia affected the prevalence of eclampsia. A practical approach model was needed to increase knowledge, attitudes, and practices in preventing eclamp-

sia. A mobile application that was effective, easy to use, and understandable was considered one of the solutions. This study aimed to develop an appropriate and user-friendly mobile application for preeclampsia mothers and spouses to prevent eclampsia. The study design was cross-sectional and was conducted in two stages. The first stage identified the content needs for eclampsia prevention in a mobile application. It involved 86 participants selected using the convenience sampling technique and a 20-item questionnaire. The second stage focused on mobile application development and usability testing using the SKAMA (Skala Kebolehgunaan Aplikasi Mudah Alih), which included a 10-item questionnaire with ten participants. Statistical analysis included the distribution frequencies of variables related to content needs and the application's usability, as assessed by beta testers using the SKAMA questionnaire. Out of the 20 questionnaire items assessing the level of need, the lowest percentage of strongly needed items for preeclampsia mothers was "Recommended and Prohibited Activities" (65%). For spouses, it was "Recommended and Prohibited Activities" and "Equipment to be Prepared" (88.2%). In the ten-item questionnaire, preeclampsia mothers scored the highest (50%) on the statement, "Various functions are well integrated, and they learned to use the mobile application very quickly." In comparison, spouses scored the highest (90%) on the statement, "The mobile application is easy to use, and they feel confident using it. All participants confirmed that the mobile application had the necessary content (appropriate). The results of the mobile application testing showed positive responses from pre-eclampsia mothers and spouses (user-friendly). It is essential to obtain support from policymakers and conduct periodic monitoring and evaluation of the application's consistency to have implications for eclampsia prevention practices.

Correspondence: Mamat Mamat, Politeknik Kesehatan Kemenkes Bandung, Indonesia.

E-mail: mamat.researcher@gmail.com

Key words: eclampsia prevention; mobile application; mother; spouse.

Contributions: MM, preliminary, conceptual of subject research, methodology, data collection, data analysis, result tabulating, data management, results and discussion, collecting of references; TS, conceptualization, methodology, formal analysis, validation, and writing – original draft, review and editing; edit manuscript.

Conflict of interest: all of the authors declared no conflict of interest.

Ethics approval and consent to participate: the research has received ethical approval from the Health Research Ethics Commission at Politeknik Kesehatan Kemenkes Bandung, Indonesia, with the following ethical certificate number: 13/KEPK/EC/IV/2022. During the research, the researcher emphasised the ethical principles of informed consent, respect for human rights, goodwill, and non-maleficence.

Patient consent for publication: written informed consent was obtained for anonymised patient information to be published in this article.

Funding: this research was supported by a research grant DIPA Politeknik Kesehatan Kemenkes Bandung, Contract number: BN.01.02/3.10/P.1964.1/date 10/3/2022

Availability of data and materials: all data generated or analysed during this research are included in this published article.

Acknowledgements: we want to be thankful to the Director and Funding staff of Politeknik Kesehatan Bandung, who were supported by funding from DIPA. Thank you to the Director of Health Polytechnic Bandung Ministry of Health and Head of Office Health District. Karawang has supported and facilitated research activities.

Received: 12 September 2023.

Accepted: 17 November 2023.

Early access: 30 November 2023.

This work is licensed under a Creative Commons Attribution 4.0 License (by-nc 4.0).

©Copyright: the Author(s), 2023

Licensee PAGEPress, Italy

Healthcare in Low-resource Settings 2024; 12:11785

doi:10.4081/hls.2023.11785

Publisher's note: all claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article or claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.

Introduction

Maternal mortality can be attributed to many factors. These factors allude to the mother's role as both an object and a subject, particularly in the context of maternal knowledge and attitudes related to pre-eclampsia.¹ Based on the study's results, it was found that the level of knowledge about pre-eclampsia and eclampsia among pregnant women was less than 47%.² The lack of information and educational level contributes to the low level of knowledge. The level of knowledge and attitudes of mothers with pre-eclampsia is crucial in making decisions aimed at enhancing their health and preventing illness and mortality.³ In addition to the low levels of knowledge and attitude related to eclampsia cases, the inadequate practice of prevention among preeclampsia mothers is a substantial contributing factor to the occurrence of eclampsia.⁴ Another factor that deserves attention is the limited involvement of family members, especially spouses, in supporting a mother during pregnancy.⁵ Husbands need to be vig-

ilant and prepared for the possibility of emergencies during pregnancy and childbirth.⁶ A study indicated that, on average, spouses played a minimal role when their wives were pregnant and during delivery, particularly in domestic responsibilities and social functions.⁷ Increasing awareness, fostering a sense of responsibility, and garnering family support (mainly from spouses), which includes preparing necessary funds and facilities for anticipatory measures, are essential steps to ensure the safety of pregnant mothers. Based on a study conducted through interviews with five pregnant mothers with pre-eclampsia and their partners, it was discovered that the majority lacked knowledge about pre-eclampsia, what steps to take, and how to ensure safe delivery without experiencing eclampsia. Sudirman *et al.* (2019) emphasised the need for a practical approach model to address the low levels of knowledge, attitudes, and practices in preventing eclampsia among pregnant women, along with increased family or spouse involvement.⁷ The most effective solution is enhancing communication, information, and education through easily accessible and understandable media for families and pregnant women. Another study revealed that 86.9% of pregnant women and their families expect high-quality service, with 78.3% recommending internet-based media for health services (such as mobile health applications). Furthermore, 90.9% of healthcare workers believe Telehealth can enhance service accessibility.⁸ The design of communication, information, and education through internet-based social media is expected to strengthen the abilities, attitudes, and behaviour of preeclamptic pregnant women and their families (couples) involved in health services to reduce the incidence of childbirth complications due to pre-eclampsia. Internet-based information media approaches already exist, such as pre-eclampsia-detector, preclampsia.com 6, pre-eclampsia-calculator 7, and Dear Mother App,⁹ as well as Short Message Service (SMS). However, these applications have limitations. For instance, they lack specific functional information regarding pre-eclampsia and eclampsia prevention practices. Moreover, the mothers and spouses need to operate the applications more frequently, and some require email logins, making it challenging for pregnant women and their partners to use them.

A mobile health application is an informational and educational medium that addresses preventing pregnancy disorders, particularly eclampsia.¹⁰ It also serves as a communication platform between preeclampsia mothers and their spouses to prevent eclampsia. The developed mobile health application provides specific information for preeclampsia mothers, engaging their families and integrating input based on the needs of pregnant women with pre-eclampsia, opinions from healthcare providers (including midwives and doctors), and literature studies. All information is presented on the Android platform in an engaging, easy-to-understand, and informative manner to enhance knowledge, attitudes, and behaviours (practices) to prevent pregnancy disorders, including eclampsia.

Materials and Methods

Design study

The study design was a cross-sectional study conducted in two stages. The first stage identified the mobile application content needs for eclampsia prevention, and the second stage of development of the mobile application referred to the specified content result and then collaboration with Internet Technology experts. After the mobile application was developed, the level of usability

of the mobile application was tested. If the mobile application has a positive response, the mobile application is already applied.

The research took place from March 2022 to May 2022, commencing with the initial stage of questionnaire testing in collaboration with several Maternity Clinics. The study was conducted in 10 health centres, selected based on having the highest referral cases of severe pre-eclampsia, as per data from the District Health Office Karawang's dashboard at <https://www.sijariemas.org/>.

This study received approval from the Ethical Commission of the Bandung Ministry of Health Polytechnic.

Population and sample

Population: This study targets pregnant mothers and their spouses. The sampling technique involved accidental sampling across ten public health centres, resulting in a total sample size of 86 respondents based on sample size calculations.

Inclusion criteria: Pre-eclampsia mothers with a gestational age greater than 20 weeks, who have a spouse, and possess an Android phone. Additionally, the spouse of the pre-eclampsia mother should also have an Android cellphone.

Exclusion criteria: Any conditions falling outside the defined inclusion criteria

Data collection

Data is collected in two stages. The first stage identified was determining the material needs in applications related to preventing pregnancy disorders (eclampsia) in pregnant mothers. The number of questionnaires is 20 statements, with answer categories five = Very Needed (NV), 4 = Needed (N), 3 = Not Very Needed (NVN), 2 = Not Needed (NN), 1 = Very Not Needed (VNN). The second stage of development of the mobile application referred to the identified content result and then collaboration with Internet Technology experts. After the mobile application was developed, the level of usability of the mobile application was measured. The measuring variable consists of 10 statements of the mobile application's usability and positive comments (numbers 1, 3, 5, 7 and 9) and negative statements (numbers 2, 4, 6, and 10). Each statement consists of 5 categories on the Likert scale; statement positive with a score of 5 = Strongly agree, a score e 4 = Agree, score of 3 = Neutraa l, score e 2 = Disagree e, sof core 1 = Strongly Disagree, otherwise a negative statement score 5 = Strongly disagree, score 4 = Disagree, score 3 = Neutral, score 2 = agree, score 1 = Strongly agree to Respond ability and ease level

The application is categorised into three groups: positive responses, neutral responses, and negative responses. A positive response occurs when the respondent selects item scores 5-4 (Strongly Agree and Agree) for a positive statement and item scores 1-2 (Strongly Disagree and Disagree) for a negative statement. A response is categorised as neutral if the respondent selects a score of 3 (Neutral), and it is considered a negative response if the respondent chooses a score of 1 or 2 (Strongly Disagree or Disagree) for a positive statement and a score of 4 or 5 (Strongly Agree or Agree) for a negative statement.

Data analysis

The variables analysed univariately included 1) Socio-demographic data, 2) the Need for Communication Information, Education (CIE) for developing content applications, and 3) The telehealth usability test. Data analysis was conducted by presenting the results of descriptive data analysis. Since all data are categorical, the study involved frequency distribution and data presentation in percentages (%).

Results

Respondents amount to 86 samples of 60 pre-eclampsia mothers and 26 spouses. The results are explained as follows:

Figure 1 shows the main menu of the mobile application, including profile, information, communication, background, and log-out menus. The menu also provides contact and coordination between the health worker, mother and spouse. Table 1 reviews 20 items of closed statements on the level of IEC needs. Among the 114 respondents (60 pregnant women with pre-eclampsia, 26 pairs of pregnant women, and 28 health workers), over 70% indicated a strong level of need. Notably, the highest percentages in the 'Strongly Needed (SN)' category were found for another pregnancy danger signs at 78.9%, Preparation for childbirth financing at 79.8%, What the husband should do at 78.1%, Explanation of why you have to take medicine at 80.7%, the role of the family in check activities at 78.9%, and the fulfilment of nutrition during pregnancy at 81.6%.

In Table 2 and Table 3, involving 60 pregnant women with pre-eclampsia, the most significant percentages in the 'Strongly Needed (SN)' category were found for another pregnancy danger sign (76.7%), Preparation for maternity financing (76.7%), What the husband should do (75%), an explanation of why you have to take medicine (75%), the role of the family in check activities (75%), and the fulfilment of nutrition during pregnancy (76.7%), as well as the reason for maternity at home while sick (77.2%).

As for the husbands of pregnant women, in terms of 20 items of closed statements regarding the level of need for IEC and coordination, all of which indicated a demand level of over 80%, with the most significant statement items being the causes of pre-

eclampsia and eclampsia, what husbands should do, nutritional fulfilment of pregnant women, and information on the telephone numbers of officers, each scoring 96.2%. Additionally, items related to IEC and coordination that were 'Strongly Needed (SN)' included the understanding of pre-eclampsia and eclampsia at 82.1%, an explanation of why you have to take medication at 82.1%, the frequency of prenatal check-ups visits at 78.6%, and the fulfilment of nutrition for pregnant mothers at 78.6%. In Table 4, Statement 1 (+), 'I like the use of this application,' was met with a positive response from pregnant women with pre-eclampsia and their husbands, with a score of 5-4, indicating a positive response for both. For Statement 2 (-), 'this application is too complicated,' 50% of the responses were positive, and 50% were neutral from pregnant women, while partners (husbands of pregnant women) responded with 90% positive and 10% neutral responses. Statement 3 (+), 'this application is easy to use,' received a 90% positive response from pre-eclampsia mothers, with 10% providing a neutral response, while the partners showed 100% positive responses. Statement 4 (-), 'the need for assistance to use this application,' received positive responses from 60 respondents (60% positive and 40% neutral) for pre-eclampsia mothers, while husbands provided 90% positive and 10% neutral responses. In Statement 5 (+), 'The contents of this application are well-structured and interconnected,' 80% of pregnant women gave a positive response, while 100% of their husbands gave a positive response. For Statement 6 (-), 'This application is not steady (confusing),' 80% of pre-eclampsia mothers gave a positive response, 20% provided a neutral response, while all husbands gave a positive response. Statement 7 (+), 'learn to use this application very quickly,' was met with 100% positive responses from pre-eclampsia mothers. For husbands, 90% responded positively, and 10% neu-

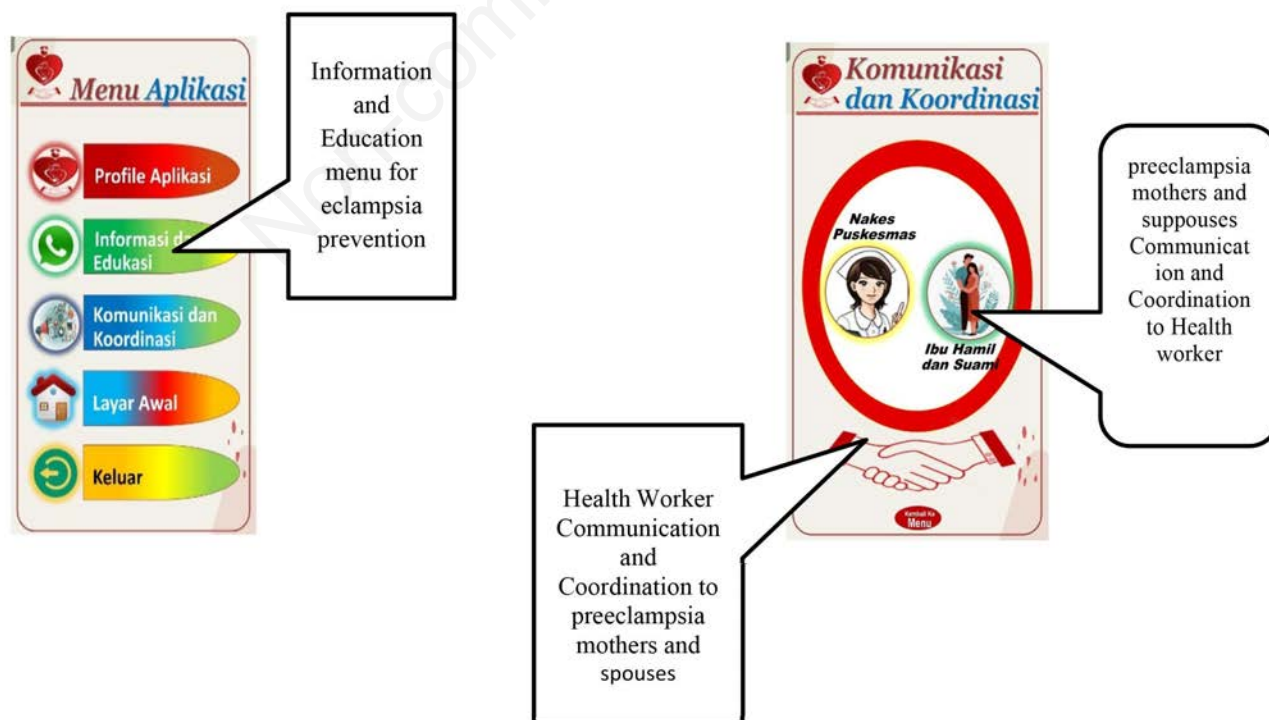


Figure 1. Mobile application main menu.

trally. Statement 8 (-), ‘This application is awkward/complicated to use,’ received a positive response from 80% of pre-eclampsia mothers, and 20% were neutral. In comparison, 90% of their husbands responded positively, with 10% providing a tepid response. Statement 9 (-), ‘There is a feeling of confidence in using this application,’ received positive responses from 80% of pre-eclamp-

sia mothers, with 20% neutral responses. Of the partners, 100% gave a positive response. In Statement 10 (-), ‘You need to learn a lot before using the application,’ 70% of pre-eclampsia mothers responded positively, and 30% were neutral. For partners, 80% provided a positive response, with 20% showing a tepid response.

Table 1. Socio-demographic data.

Socio-demographic data	Respondent	
	Pre-eclampsia mothers (n=60)	Spouses (n=26)
Level education		
Elementary school	20 (64.5%)	11 (35.5%)
Junior high school	16 (76.2%)	5 (23.8%)
Senior high school	22 (71%)	9 (29%)
College	2 (66.7%)	1 (33.3%)
Age group		
≤ 25 years old	11 (91.7%)	1 (8.3%)
>25 years old	49 (66.2%)	25 (33.8%)
Mobile phone use		
Never	4 (57.1%)	3 (42.9%)
Ever	10 (76.9%)	3 (23.1%)
Seldom	16 (76.2%)	5 (23.8%)
Often	15 (65.2%)	8 (34.8%)
Always	15 (68.5%)	7 (31.8%)
Social media platform use		
Wach App. Facebook. Instagram	3 (75%)	1(25 %)
Wach App. Facebook	7 (58.3%)	5 (41.7%)
Watch App	44 (72.1%)	17 (27.9%)
Facebooks	5 (71.4%)	2 (28.6%)
Twitter	1 (50%)	1 (50%)

Table 2. Need an item for Communication, Information, Education of eclampsia prevention of incidence (n=86).

No	Need of Communication, Information, Education	Level of need			
		SN	N	NSN	IN
1.	Definition of pre-eclampsia and eclampsia	66 (76.7%)	17 (19.8%)	3 (3.5%)	
2	Causes of pre-eclampsia and eclampsia	68 (79.1%)	14 (16.3%)	3 (3.5%)	1 (1.2%)
3	Signs and symptoms of preeclampsia-eclampsia	68 (79.1%)	14 (16.3%)	4 (4.7%)	
4	Complications of pre-eclampsia	65 (75.6%)	15 (17.4%)	3 (3.5%)	
5	Other pregnancy danger signs	68 (79.1%)	15 (17.4%)	3 (3,5)	
6	Recommended and prohibited activities	62 (72.1%)	21 (24.4%)	3 (3.5%)	
7	Preparation for maternity financing	70 (81.4%)	12 (14.0%)	4 (4.7%)	
8	Equipment to be prepared	66 (76.7%)	16 (18.6%)	4 (4.7%)	
9	What should a husband do	70 (81.4%)	13 (15.1%)	3 (3.5%)	
10	Explanation of why you have to take medicine	65 (75.6%)	17 (19.8%)	4 (4. %)	
11	The role of the family in check activities	69 (80.2%)	15 (17.4%)	23 (2.6%)	
12	Medication reminder device	65 (75.8)	17 (18.6%)	4 (4.7%)	
13	Frequency of pregnancy check-up visits	64 (74.4%)	18 (20.9%)	4 (4.7%)	
14	Foods and drinks that can be consumed	64 (74.4%)	19 (22.1%)	3 (3.5%)	
15	Foods and drinks that should not be consumed	64 (74.4%)	19 (21.1%)	3 (3.5%)	
16	Fulfilment of nutrition during pregnancy	71 (82.6%)	13 (15.1%)	2 (2.3%)	
17	Information on the telephone number of a health worker (midwife)	67 (77.9%)	16 (18.6%)	3 (3.5%)	
18	Information Number of close neighbours/relatives	66 (76.7%)	16 (18.6%)	4 (4.7%)	
19	Hospital Emergency Number Information	63 (73.3%)	19 (22.1%)	4 (4.7%)	
20	Reasons to give birth in the hospital	67 (77.7%)	15 (17.4%)	3 (3.5%)	1 (1.2%)

SN, strongly needed; N, needed; NSN, not strong needed; NN, not needed.

Discussion

Referring to the results of the application trial, which demonstrated a positive response across all variable levels of ease of use, the study's findings indicated a significant difference in the knowl-

edge and attitude of pregnant women after receiving an intervention using the mobile danger signs of the third-trimester pregnancy app. A study conducted in Brazil on the development of telemedicine and e-health shows that improvements can enhance the user experience.¹¹ Various studies have highlighted the impor-

Table 3. Level of Communication, Information, Education and Coordination of Prevention of Incidence of Pregnancy Disorders (Eclampsia) based on level of strongly needed. n=60 Preeclampsia mothers, Spouses=26.

No	Communication, Information, Education	Level of strongly needed	
		Pre-eclampsia mothers	Spouses
1	Definition of pre-eclampsia and eclampsia	42 (70.0%)	24 (92.3%)
2	Causes of pre-eclampsia and eclampsia	43 (71.7%)	25 (96.2%)
3	Signs and symptoms of preeclampsia-eclampsia	44 (73.3%)	24 (92.3%)
4	Complications of pre-eclampsia	41 (68.3%)	24 (92.3%)
5	Other pregnancy danger signs	46 (76.7%)	22 (84.6%)
6	Recommended and prohibited activities	39 (65.0%)	23 (88.5%)
7	Preparation for maternity financing	46 (76.7%)	24 (92.3%)
8	Equipment to be prepared	43 (71.7%)	23 (88.5%)
9	What should a spouse do	45 (75.0%)	25 (96.2%)
10	Explanation of why you have to take medicine	45 (75.0%)	24 (92.3%)
11	The role of the family in check activities	45 (75%)	24 (92.3%)
12	Medication reminder device	41(68.3%)	24 (92.3%)
13	Frequency of pregnancy check-up visits	39 (66.1%)	24 (92.3%)
14	Foods and drinks that can be consumed	40 (66.7%)	24 (92.3%)
15	Foods and drinks that should not be consumed	41 (68.3%)	25 (88.5%)
16	Fulfilment of nutrition during pregnancy	46(76.7%)	25 (96.2%)
17	Information on the telephone number of a health worker (midwife)	42(70.0%)	25 (96.2%)
18	Information number of close neighbours/relatives	42 (70%)	24 (92.3%)
19	Hospital emergency number information	40 (66.7%)	23 (88.5%)
20	Reasons to give birth in the hospital	43 (71.7%)	24 (92.3%)

Table 4. Usability of application test (n=10 beta tester).

No	Level of App. usability	Status	Level of needs				
			SA	A	N	DS	SDA
1.	Like to use the mobile application frequently	Pre-eclampsia mothers	5 (50%)	5 (50%)			
		Spouses	2 (20%)	8 (80%)			
2	Mobile applications are unnecessarily complex	Pre-eclampsia mothers			5 (50%)	3 (30%)	2 (20%)
		Spouses			1(10%)	8 (80%)	1 (10%)
3	Mobile application easy to use	Pre-eclampsia mothers	3 (30%)	6 (60%)	1 (10%)		
		Spouses	9 (90%)	1 (10%)			
4	Need assistance using a mobile application	Pre-eclampsia mothers			4 (40%)	6 (60%)	
		Spouses			1 (10%)	8 (80%)	1 (10%)
5	Various functions are well-integrated	Pre-eclampsia mothers	5 (50%)	3 (30%)	2 (20%)		
		Spouses	7 (70%)	3 (30%)			
6	Too much inconsistency	Pre-eclampsia mothers			2 (20%)	5 (50%)	3(30%)
		Spouses				10 (100%)	
7	Learn to use mobile applications very quickly	Pre-eclampsia mothers	5 (50%)	5 (50%)			
		Spouses	8 (80%)	1 (10%)	1 (10%)		
8	Mobile applications are very cumbersome/awkward to use	Pre-eclampsia mothers			2 (20%)	5 (50%)	3 (30%)
		Spouses			1 (10%)	9 (90%)	
9	Confident using a mobile application	Pre-eclampsia mothers	3 (30%)	5 (50%)	2 (20%)		
		Spouses	9 (90%)	1 (10%)			
10	I needed to learn a lot of things before launching the mobile application	Pre-eclampsia mothers			3 (30%)	6 (60%)	1 (1%)
		Spouses			2 (20%)	6 (60%)	2 (20%)

SA, strongly agree; A, agree; N, neutral; DA, disagree; SDA, strongly disagree.

tance of provider-based counselling in increasing knowledge about pre-eclampsia.³ Maternal education apps and websites must provide information and resources for individual attention and social support.¹² In specific cases, mobile applications have shown promise in improving aftercare for women with pre-eclampsia, with medical specialists playing a significant role.¹³ Introducing pregnant women into general programs is considered a recommended first step, and mobile-based programs have been perceived as feasible for high-risk pregnant women, providing valuable insights for future program design.^{14–16} Electronic administration of health-related surveys on Android tablets has been more efficient and time-saving than paper-based surveys, especially in resource-poor settings.¹⁷ Mobile applications focused on diet and oral health have demonstrated potential in preventing early childhood caries, and this approach can be extended to the development of applications targeting pre-eclampsia prevention in pregnant women.^{18,19} Overall, there is a need for improved engagement, information quality, and scientific evidence supporting the use of medical devices in healthcare applications. Health apps have effectively tracked patient-reported outcomes during and after treatment, although many of these applications are specifically designed for cancer patients.²⁰ Furthermore, we have observed the acceptability and feasibility of remote training platforms for treatment adherence.²¹ A website or mobile application to support maternal education should include information and resources for individual attention and social support. Its impact on the health and satisfaction of women should be evaluated in various settings.¹²

The knowledge and attitudes of preeclampsia mothers and their spouses need to be enhanced, along with promoting better self-care. In addition, the application can save them time.²² Referring to the study results, the use of mobile applications for pregnant women at high risk of pre-eclampsia provides insights that can be directly applied to future designs aimed at reducing mortality and morbidity from pre-eclampsia and eclampsia.¹⁵

There is a relationship between the need for a practical approach model, stemming from the low knowledge, attitudes, and practices of preventing eclampsia in pregnant women, and the significant involvement of the family or husband.⁷ An increasing role of communication, information, and education through media that is effective, easy to use, and understandable by families and pre-eclampsia mothers is the right solution. Communication is a message, either verbal or written, or a series of statements with order sequences or meanings that can be interpreted from notifications or collections of letters. Education refers to the process of learning and the transmission of habits within a group of people from one generation to the next through teaching and training.²³

The definition of coordination involves synchronised and systematic efforts to allocate the right resources and direct the execution of actions in harmony with predetermined goals.²⁴ CIE is a combination of words that convey interconnected meanings, reinforcing each word to create complete sentences that are significant for transferring and receiving messages about a situation. It serves an educational purpose to promote cooperation and function. Coordination and collaboration in telehealth are vital for establishing harmonious communication between families/pregnant women and healthcare providers.²⁵

Technology will continually evolve, and humans will never be disconnected from it. One form of technological development is using the Internet through Android devices. The use of the Internet on Android devices has the effect of changing how people respond to information and communication behaviour.²⁶ The internet has significantly influenced lifestyle changes due to technological advancements.²⁷ His statement conveyed that the development of

information and communication technology and the widespread impact of globalisation have changed how people live, interact, learn and redefined the concept of cultural identity. The Internet renders traditional notions of space, time, and distance meaningless and even obsolete. Everyone can access information anytime, anywhere, regardless of physical distance, which can help overcome issues related to the user population, such as language variations, cost constraints, and internet accessibility. The new application also offers features with new icons and customisation options that users can easily understand.²⁸

Telehealth is rooted in the current digital era. It's important to note that 196.7 million, or 73.7% of Indonesia's population, are internet-literate.²⁹ This is a situation that has led to everyone avoiding direct contact due to the COVID-19 outbreak, one of the consequences of which is the impact on pregnancy check-ups. As a study has shown, the average volume of weekly prenatal visits decreased by 16.1%, from 898 to 761 weekly visits.³⁰ This has an impact on the inadequate monitoring of pregnant women with pre-eclampsia, resulting in a relatively high risk of pregnancy disorders, including eclampsia.

Conclusions

The research findings indicated that nearly all respondents required information and education on preventing eclampsia. The content of the application consisted of 20 items, which were considered suitable for addressing these needs. The results of the usability test showed that pre-eclampsia mothers and their spouses responded positively to the application and found it easy to use. This favourable feedback has significant implications for improving knowledge and awareness regarding the prevention of pregnancy disorders, particularly eclampsia.

References

- Mekie M, Addisu D, Bezie M, et al. Knowledge and attitude of pregnant women towards preeclampsia and its associated factors in South Gondar Zone, Northwest Ethiopia: a multi-centre facility-based cross-sectional study. *BMC Pregnancy Childbirth* 2021;21:160.
- Ulfa TM. Tingkat Pengetahuan Ibu Hamil Tentang Preeklampsia di Puskesmas Padang Bulon Kota. *Universitas Sumatera Utara*; 2017.
- Joshi A, Beyuo T, Oppong SA, et al. Preeclampsia knowledge among postpartum women treated for preeclampsia and eclampsia at Korle Bu Teaching Hospital in Accra, Ghana. *BMC Pregnancy Childbirth* 2020;20:625.
- Akbar MIA, Kinanti H, Ernawati EE, Lestari P. Maternal and perinatal outcomes of early-onset and late-onset preeclampsia at a tertiary centre hospital. *J South Asian Fed Obstet Gynaecol* 2021;13:338-42.
- Rumaseuw R, Berliana SMM, Nursalam N, et al. Factors Affecting Husband Participation in Antenatal Care Attendance and Delivery. In: M.A. R, editor. *3rd International Conference on Tropical and Coastal Region Eco-Development 2017*. Badan Pusat Statistik, Supiori District of Papua Province, Indonesia: Institute of Physics Publishing; 2018. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85043685035&doi=10.1088%2F1755-1315%2F116%2>

- F1%2F012012&partnerID=40&md5=8ddc4c8cf33a374c97a6f6db26d49fb8
6. Kurniati A, Chen C-M, Efendi F, Elizabeth Ku L-J, Berliana SMM. Suami SIAGA: Male engagement in maternal health in Indonesia. *Health Policy Plan* 2017;32:1203-11.
 7. Sudirman S, Puspitawati H, Muflikhati I. Peran Suami dalam Menentukan Kesejahteraan Subjektif Istri pada Saat Hamil dan Melahirkan. *J Ilmu Kel dan Konsum* 2019;12:26-37.
 8. Jeganathan S, Prasannan L, Blitz MJ, et al. Adherence and acceptability of telehealth appointments for high-risk obstetrical patients during the coronavirus disease 2019 pandemic. *Am J Obstet Gynecol MFM* 2020;2:100233.
 9. Universitas Diponegoro. Sayang Ibu, a Pregnancy Monitor Application with Emergency Button has been Launched by FKM UNDIP - Universitas Diponegoro. News, Research & Community Services. 2020. p. 1.
 10. Indriani D, Damayanti NA, Teguh D, Ardian M, Suhargono H, Urbaya S, et al. The maternal referral mobile application system for minimising the risk of childbirth. *J Public Health Res* 2020;9:105-9.
 11. Gadenz SD, Harzheim E, Amaral HG, Drehmer M. Development and Assessment of a Mobile Nutritional Counseling Tool for Primary Care Physicians. *Telemed e-Health* 2020;26:805-11.
 12. Artieta-Pinedo I, Paz-Pascual C, Bully P, et al. Design of the maternal website EMaHealth that supports decision-making during pregnancy and postpartum: Collaborative action research study. *JMIR Form Res* 2021;5:1-14.
 13. Suprihatin E, Wuryaningsih SH. The development of an assessment instrument for postpartum patients with severe preeclampsia-eclampsia based on the need for help and self-care models. *J Ners* 2022;17:47-54.
 14. Dijkhuis TE, Bloem F, Kusters LAJ, et al. Investigating the current knowledge and needs concerning a follow-up for long-term cardiovascular risks in Dutch women with a preeclampsia history: A qualitative study. *BMC Pregnancy Childbirth* 2020;20:486.
 15. Feroz AS, De Vera K, Bragagnolo ND, et al. Understanding the Needs of a Mobile Phone-Based Telemonitoring Program for Pregnant Women at High Risk for Pre-Eclampsia: Interpretive Qualitative Description Study. *JMIR Form Res* 2022;6:e32428.
 16. Aditiawarman, Ernawati, Joewono HT, et al. Maternal cardiovascular risk in five years after labour with early-and late-onset severe preeclampsia. *Int J Pharm Res* 2020;12:1401-7.
 17. Abdel-All M, Angell B, Jan S, et al. The development of an Android platform to undertake a discrete choice experiment in a low resource setting. *Arch Public Heal* 2019;77:1-5.
 18. Lim S-Y, Lee K-W, Seow W-L, et al. Effectiveness of integrated technology apps for supporting healthy food purchasing and consumption: A systematic review. *Foods* 2021;10:1861.
 19. Vivilyana V, JosephNg PS, Shibghatullah AS, Eaw HC. JomImage: Weight control with mobile snapfudo. K. A, S. K, R. B, editors. Vol. 1252 AISC, Intelligent Systems Conference, IntelliSys 2020. Institute of Computer Science and Digital Innovation, UCSI University, Kuala Lumpur, Malaysia: Springer; 2021. p. 168-80.
 20. Escriche-Escuder A, De-Torres I, Roldán-Jiménez C, et al. Assessment of the quality of mobile applications (Apps) for management of low back pain using the mobile app rating scale (mars). *Int J Environ Res Public Health* 2020;17:1-16.
 21. Schuman-Olivier Z, Borodovsky JT, Steinkamp J, et al. MySafeRx: A mobile technology platform integrating motivational coaching, adherence monitoring, and electronic pill dispensing for enhancing buprenorphine/naloxone adherence during opioid use disorder treatment: A pilot study. *Addict Sci Clin Pract* 2018;13:21.
 22. Ghaemi MM, Moulaei K, Bahaadinbeigy K, Ghaf-Faripour Z. The Design and Evaluation of a Mobile-based Application to Facilitate Self-care for Pregnant Women with Preeclampsia during COVID-19 Prevalence. *J Biomed Phys Eng* 2021; 11:551-60.
 23. Chaw LY, Tang CM. Learner Characteristics and Learners' Inclination towards Particular Learning Environments. *Electron J e-Learning* 2023;21:1-12.
 24. Lai NYG, Foo WC, Tan CS, et al. Understanding Learning Intention Complexities in Lean Manufacturing Training for Innovation on the Production Floor. *J Open Innov Technol Mark Complex* 2022;8:110.
 25. Lu DJ, Girgis M, David JM, et al. Evaluation of Mobile Health Applications to Track Patient-Reported Outcomes for Oncology Patients: A Systematic Review. *Adv Radiat Oncol* 2021;6:100576.
 26. Aw EC-X, Tan GW-H, Chuah SH-W, et al. Be my friend! Cultivating parasocial relationships with social media influencers: findings from PLS-SEM and fsQCA. *Inf Technol People* 2023;36:66-94.
 27. Reveley J. The Exploitative Web: Misuses of Marx in Critical Social Media Studies. *Sci Soc* 2013;77:512-35.
 28. Nocum AA, Baltao JM, Agustin DR, Portus AJ. Ergonomic Evaluation and Design of a Mobile Application for Maternal and Infant Health for Smartphone Users among Lower-income Class Filipinos. *Procedia Manuf* 2015;3:5411-8.
 29. Leo Dwi Jatmiko. Melek Internet. *Bisnis.com*. 2020;
 30. Peahl AF, Powell A, Berlin H, Smith RD, Krans E, Waljee J, et al. Patient and Provider Perspectives of a New Prenatal Care Model Introduced in Response to the Coronavirus Disease 2019 Pandemic. *Am J Obstet Gynecol* 2021;224:384.e1-384.e11.