

The Use of Application Based on Cellular as an Information Media in Pregnancy

ANISYA SELVIA¹, DWI ERNAWATI²

¹Faculty of Health Midwifery Program, 'Aisyiyah University of Yogyakarta, Siliwangistreet, Yogyakarta, Indonesia

²Faculty of Health Midwifery Program, 'Aisyiyah University of Yogyakarta, Siliwangistreet, Yogyakarta, Indonesia

Correspondent author to Anisya Selvia email: selviaanisya@yahoo.com, dwiernawati09@gmail.com

ABSTRACT

Background: The maternal mortality rate is still very high. This also happens in other countries in the world. This situation causes anxiety for each country. One of the causes of death in pregnant women is maternal knowledge about health information during pregnancy. The use of cellular-based applications is currently the leading choice in finding information, and the same thing also happens in pregnant women. Pregnant women currently use many cellular-based applications to access information about pregnancy.

Aim: To find out how pregnant women use cellular-based applications as a medium of information in pregnancy.

Method: Five review stages are used in this review. The five stages include: identifying research questions, identifying relevant studies, choosing studies, mapping data, compiling, summarizing, and reporting the results.

Result: A total of 23 publications were included. Thematic analysis is used to identify key concepts. We classify these critical concepts into three themes: Health information in pregnancy based on text messages, the benefits of searching for information using cell phones in pregnancy, and the use of technology as an effort to improve maternal and child health.

Keyword: Mobile Health, Antenatal Care, Pregnancy

INTRODUCTION

The use of cellular-based applications in health, commonly known as Mobile Health Technology (mHealth), uses cell phones with wireless techniques to search for information, primarily related to health [1]. Adequate antenatal care is very important for pregnant women. Cellular telephones are a powerful potential for disseminating health information, especially for pregnant women [2]. All people can use cellular communication technology because it requires a low cost [3]. Currently, health information via cellphones is being developed in low and middle-income countries. The Ministry of Health and Family Welfare has provided the platform as the latest mHealth initiative. One country that has implemented this is Bangladesh [4]. mHealth is used to improve health access, especially in areas with a limited health workforce and high disease burden. Short message service is one part of mHealth that can influence people's behavior, especially pregnant women because it is efficient enough to be used. Costs incurred are low and can disseminate health information in areas that are difficult to reach. mHealth can be a beneficial strategy for low and middle-income countries to improve mothers and children [5]. In addition to the use of Short Message Services, another method used by pregnant women in finding cellular based information is by using the internet. The internet has become one of the most popular health information sources in recent years. Throughout the world, 4.5% of information searches are obtained through the internet. The internet provides easier access for pregnant women to find information about pregnancy. Today, many pregnant women first access information about their pregnancies before examining a health worker [6]. Given the importance of using cellular-based applications in modern times as it is today for pregnant women, Scoping Review explores how information obtained by pregnant women through text

messaging services, digital media, the benefits of using technology, and things needed by pregnant women as a solution to improve maternal and child health which can later reduce maternal mortality and infant mortality.

METHODOLOGY

This review used a grouping review methodology suggested by Arksey and O'Malley [6] and further developed by Levac et al [3]. There were four reasons for conducting a scoping review: (1) to examine the range of research activities, (2) to conduct a full systematic review. (3) to summarize and disseminate research findings, and (4) to identify research gaps in existing literature steps taken in this scoping review consist of: (1) identifying research questions, (2) identifying relevant studies, (3) selecting studies, (4) mapping data, (5) compiling, summarizing and reporting the results.

Step 1: Identify Research Questions This review aims explicitly to determine the form of health information in pregnancy based on text messages? What are the benefits of searching for information using cellphones in pregnancy? Furthermore, how to use technology to improve maternal and child health?

Step 2: Identify Relevant Studies Three steps in the search strategy are used. The first step was to search using multiple databases such as Pubmed, Medline, Plus One, and Cochrane, which allow analyzing the title and abstract's words. The keywords entered were 'Mobile Health,' 'Antenatal care,' and 'Pregnancy.' The second step was to use all the identified keywords. All of these keywords had been searched at Scienedirect. The third step was a reference list of all identified reports and articles traced for additional studies. In the study, target eligibility criteria were health workers who work in health services that could provide health education and counseling around pregnancy. They were able to use cell phones based on

text messaging, internet services, and the study's focus was on pregnant women who had cellphones and could access the internet. Mobile Health was indeed a medium that is currently very popular with the community, especially pregnant women. Every article related to digital media, message-based health services, Mobile Health, and Mobile Phone was included. There were no restrictions

imposed on the date of publication to ensure a comprehensive and comprehensive review. The reviews were included in local and international literature and were limited to publications in English. Studies that were not related to cellular-based applications were issued in this review.

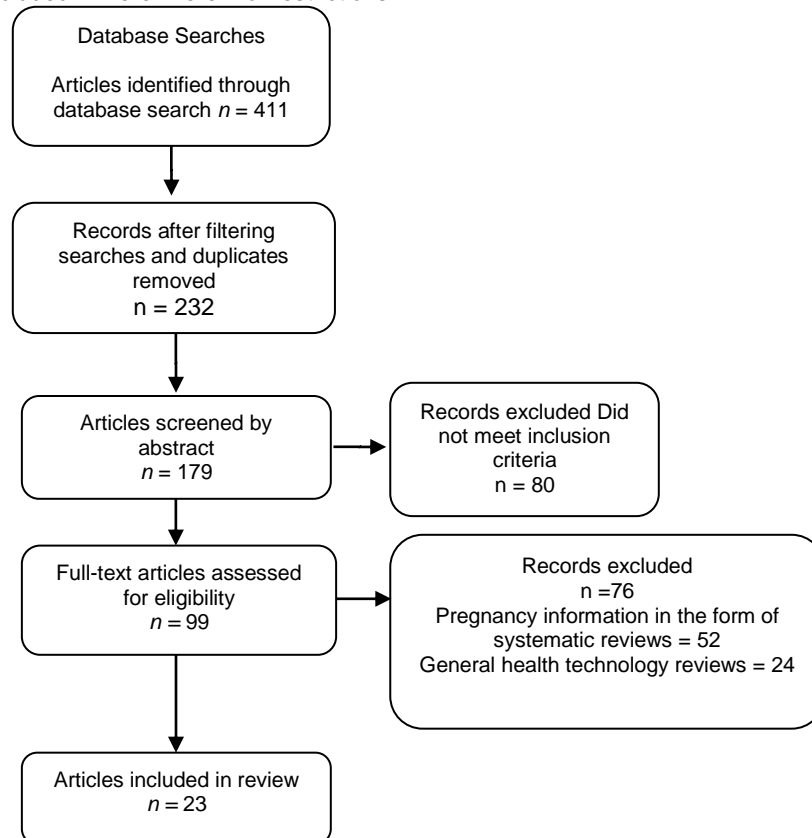


Figure 1. Flowchart of the literature search process

Step 3: Study Selection In the search for articles identified 411 articles, after being filtered for relevance it was obtained 232 articles. Then further article filtering was done to find appropriate and complete references regarding cellular-based applications and obtained 23 articles that would be used for Scoping Review. The author filters the titles and abstracts of all articles were used as inclusion criteria. The full text was taken and reviewed independently based on these criteria. Eventually, it left 23 articles for final review. Figure 1. Flowchart of the literature search process.

Step 4: Charting the Data Data from 23 articles were extracted to include critical criteria such as research location, study population, research objectives,

methodology, and significant findings or recommendations (Table 1). The author independently recorded information and then compared the extracted data. The author also consulted with the supervisor until all the content was analyzed and became a theme.

Step 5: Collating, Summarizing, and Reporting the Results Like Levac et al., the author took a three-phase approach to compile, summarize, and report results. First, descriptive numerical analysis was provided, including the number of articles, year of publication, and type of study. Second, the literature's strengths and weaknesses were identified through thematic analysis of the report's studies. This phase's final step reviewed the findings' implications with future research, practices, and policies.

Table 1 Literature include in scoping review

Author, Year, Title	Setting	Purpose (aims of the study/paper)	Methodology	Key findings/highlights
Yan Kwan Lau et al., (2014) Antenatal health promotion via short message service	a Midwife Obstetrics Unit in South Africa	To increase knowledge of antenatal health and awareness by spreading text messages about clinical procedures on antenatal visits and how to be healthy during	Mixed methods study	text messages as a medium of positive reminders and sources of motivation are considered treatments that are an extension of health care providers.

Author, Year, Title	Setting	Purpose (aims of the study/paper)	Methodology	Key findings/highlights
Annette K., et al. (2014) Using SMS to monitor adverse events following trivalent influenza vaccination in pregnant women	Australia	To implement a real-time security monitoring program for TIV (Trivalent Influenza Vaccination) given to pregnant women via SMS	Randomized control trial	<ul style="list-style-type: none"> • These findings support the safety of TIV in pregnant women. • Cellphone technology has proven to be efficient
Larissa Jennings, et al. (2015) Disparities in mobile phone access and maternal health service utilization	Nigeria	To test whether pregnant women with limited cell phone access have a different opportunities for knowledge and utilization of health services were worse than pregnant women who had cellphones and could use them anytime to obtain information	Survey	<ul style="list-style-type: none"> • Pregnant women who do not have cell phones have lower knowledge than pregnant women who have cellphones • More effort is needed to increase women's access to cellular phones and minimize the potential for health injustices caused by the health system and technological barriers to care access.
MafruhaAlam, et al. (2017) The impact of mobile phone-based messages on maternal and child healthcare behavior	Bangladesh	To assess the relationship between Aponjon's cellular telephone-based messaging services and practices regarding maternal and neonatal delivery and care in selected regions in Bangladesh	A retrospective cross-sectional survey in	Messaging for low-cost cellular phones may have the potential to positively affect mothers in providing care for newborns by delaying the time to bathe babies and other health behaviors
Gabriela Cormick et al. (2012) Interest of pregnant women in using SMS (short message service) text messages for the improvement of perinatal and postnatal care	Argentina	To survey the need for health information for pregnant women	Survey	Women in Argentina can get benefit from the mHealth program.
Ling-ling Gao, et al. (2013) Internet use by Chinese women seeking pregnancy-related information	China	To investigate whether and how Chinese pregnant women use the Internet to take information related to pregnancy	A descriptive, cross-sectional design	The internet is a source of information used by pregnant women to obtain information during pregnancy.
Livia Oliveira-Ciabati, et al (2017) PRENACEL – a mHealth messaging system to complement antenatal care	Brazil	To determine whether short text messaging service (SMS) increases the recommended range of antenatal care (ANC) practices.	Randomized controlled trial	Short text messaging services have the potential to increase the scope of recommended ANC practices, including syphilis and HIV testing
Stine Lund et al. (2014) Mobile phones improve antenatal care attendance in Zanzibar	Zanzibar	To assess antenatal care in a comprehensive way taking into consideration utilization of antenatal care as well as content and timing of interventions during pregnancy	Randomized controlled trial	<ul style="list-style-type: none"> • Cellular telephone interventions significantly increase the proportion of antenatal care visits recommended during pregnancy • more women attend antenatal visits at the end of pregnancy, and more women are detected with antepartum complications identified and can be referred • Cellphone application can contribute to improving maternal and infant health
Maria A, et al. (2018) Pregnancy Exercise and Nutrition With Smartphone Application Support	America	To evaluate the effects of a healthy lifestyle (intervention changes in antenatal behavior Supported by smartphone application technology)	Randomized controlled trial	Interventions using cellular devices do not reduce the incidence of GDM in pregnant women
Deborah Lupton (2016) The use and value of digital media for information about pregnancy and early motherhood	Australia	To find out how women use various digital media available today and what kind of information they are looking for	A focus group study	Pregnant women and those with small children give high marks to information and support what they receive from sharing resources and online applications

Author, Year, Title	Setting	Purpose (aims of the study/paper)	Methodology	Key findings/highlights
RamkrishnanBalakrishnan, et al. (2016) Continuum of Care Services for Maternal and Child Health using mobile technology	India	To assess the effectiveness of the Continuum of care service (CCS) health platform in terms of strengthening the delivery of maternal and child health services (MCH)	Randomized controlled trial	mHealth can be a potential strategy for strengthen maternal and child health systems
Lucia Borsari et al. (2017) An Innovative Mobile Health System to Improve and Standardize Antenatal Care Among Underserved Communities: A Feasibility Study in an Italian Hosting Center for Asylum Seekers	Italy	To test the functionality and acceptance of the new mHealth system in providing antenatal care among migrants	Survey	Cellular-based health systems can provide comprehensive and high-quality antenatal care among migrants
JaranitKaewkungwal et al.	Bangkok	To assess the application of	Survey	Modules are integrated and

(2010) Application of smartphone in "Better Border Healthcare Program": A module for mother and child care		mobile phones integrating into the health care system to improve antenatal care care (ANC)		successfully functioned as part of the health care system
Larissa Jennings et al. (2015), Disparities in mobile phone access and maternal health service utilization in Nigeria	Nigeria	To test whether women with limited cell phone access have different knowledge from women who often use cell phones	Survey	The use of m-Health should be developed to increase the knowledge of pregnant women
Juan Nie et al. (2016) Does mobile phone ownership predict better utilization of maternal and newborn health services?	Timor Leste	To find out whether cell phone use can increase maternal knowledge about health during pregnancy	Survey	The use of mobile health must consider socioeconomic differences
TaghreedAlhaidari et al. (2017) Feasibility and acceptability of text messaging to support antenatal healthcare in Iraqi pregnant women: a pilot study	Baghdad	To determine the feasibility and acceptability of mobile health technology and its potential to increase antenatal care services (ANC)	Randomized controlled trial	Text messaging is feasible, low cost, and acceptable to Iraqi pregnant women and encourages the age of their ANC visits
Gabriela Cormick et al. (2012) Interest of pregnant women in the use of SMS (short message service) text messages for the improvement of perinatal and postnatal care	Argentina	To find out the use of cell phones in pregnant women	Survey	Women in Argentina are interested in receiving text messages and calls with educational information about pregnancy and baby health
Christy J.W. Ledford et al. (2016) Mobile application as a prenatal education and engagement tool	Amerika	To compare the effectiveness of cellular applications versus spiral-notebook guides during prenatal care	Randomized controlled trial	Cellular applications are more effective in providing information about care during prenatal care
RuoyanGaiTobe et al. (2018) Mobile-health tool to improve maternal and neonatal health care in Bangladesh	Bangladesh	To find out whether m-Health contributes to providing information during pregnancy	Randomized controlled trial	m-Health contributes to providing information during pregnancy
Maria A. Kennelly et al. (2016) Pregnancy, exercise and nutrition research study with smartphone app support	Irlandia	To find out the effectiveness of smartphones in providing pregnancy information	Randomized control trial	Smartphones are handy in providing pregnancy information
Author, Year, Title	Setting	Purpose (aims of the study/paper)	Methodology	Key findings/highlights
Adam K. Lewkowicz et al. (2015) Social media messaging in pregnancy: comparing content of Text for baby to content of free smartphone applications of pregnancy	Amerika	To compare text content for babies with free smartphone content pregnancy apps	Survey	Text content for babies can replace social media messages in pregnancy
Anne Caroline Benski et al. (2016) Usability and feasibility of a mobile health system to provide comprehensive antenatal care in low-income countries	Madagaskar	To assess the usefulness and feasibility of the mobile health system (mHealth) to provide High-quality ANC, according to the recommendations of the World Health Organization (WHO)	Survey	The use and feasibility of the PANDA mHealth system to complete and visit ANC standards following WHO guidelines to provide promising solutions to increase access to high-quality ANCs and standards for pregnant women in remote areas
Richard MangwiAyiasi et al. (2015) Use of mobile phone consultations during home visits by Community Health Workers for maternal and newborn care: community experiences from Masindi and Kiryandongo districts	Uganda	To find out the use of cellular telephone consultation	Qualitative Study	The majority of women and VHTs argue that interventions increase maternal and newborn information, reduce costs to access care, and facilitate referrals. Women, VHT, and professional health workers acknowledged that intervention changed attitudes among women and adapted VHTs to recommended maternal and newborn care practices

FINDINGS

Descriptive summary and thematic analysis: This review consists of articles published between 2010-2018, the authors in the literature are from African countries (n = 1), Australia (n = 2), Nigeria (n = 2), Bangladesh (n = 2), Argentina (n = 2), china (n = 1), Brazil (n = 1), Zanzibar (n = 1), America (n = 3), India (n = 1), Bangkok (n = 1), Baghdad (n = 1), Ireland (n = 1), Madagascar (n = 1), Uganda (n = 1), East Timor (n = 1) and Italy (n = 1). 19 articles taken in this literature are journals with quality (Q1) and 4 journals with quality (Q2). Eleven articles are randomized control Trials. Nine articles belong to surveys. Two articles are qualitative research and 1 article is descriptive research.

Nineteen Q1 Projects were carried out in several countries, including Africa, India, Nigeria, Bangladesh, Argentina, China, Brazil, Zanzibar, America, and Australia, and one Q2 project was conducted in Australia. Seven journals discuss health information in pregnancy based on text messages. Text messages are a reminder medium and a positive source of motivation. Messaging via cell phones has the potential to affect mothers in providing care for newborns. Short cell-based text messaging services have the potential to increase the scope of ANC practices. Nine journals discussed using technology to improve maternally and child health, and seven journals discuss the benefits of cellphones in information retrieval during pregnancy. Qualitative research is research that specifically aims to explore how a pregnant woman uses digital media to get information during pregnancy

Themes from the data: The data extracted from this review scoping article is arranged in several themes. The themes included in this literature review include: Health information in pregnancy based on text messages, the benefits of searching information using cellphones in pregnancy, and the use of technology as an effort to improve maternal and child health

Health information in pregnancy based on text messages: The article was chosen, then several taken articles were part of health information in pregnancy based on text messages. Given the high use of cellphones throughout the world today, cellular-based interventions are touted as a powerful tool for disseminating health information. Cellular-based health information (mHealth) appears as a useful tool for increasing access to health services, especially in developing countries related to antenatal care [5]. The main objective explained by all papers in this scoping review is to determine whether cellular-based health information can improve clinical procedures at antenatal visits, increase the coverage of recommended antenatal care (ANC) practices, and be a healthy pregnancy. The results obtained from several articles related to health information in a text message-based pregnancy stated that text messages could motivate changes in health information-seeking behavior during pregnancy, such as delaying bathing the baby after later childbirth. In the study, pregnant women who became informants said they were interested in receiving text messages containing health information about pregnancy and health-related to him and his baby. Pregnant women

can benefit from such mHealth program and can increase the scope of recommended ANC practices.

Benefits of Searching for Information Using Cell Phones in Pregnancy: The majority of papers discuss how pregnant women use cell phones to find pregnancy-related information on the internet. The findings obtained in the article state that most pregnant women have access to the internet using cell phones. Most of them use it to retrieve health information from the beginning of pregnancy. Fetal development and nutrition in pregnancy are two of the most frequently searched topics. More than half of these pregnant women consider that information reliable. However, pregnant women who have obtained information about pregnancy on the internet do not discuss the information they get with professional health professionals such as midwives. So it is recommended that health professionals such as midwives have to provide education about pregnancy problems and ask mothers to ask for unclear information to avoid misinterpretations when obtaining information on the internet.

Use of Technology to Improve Maternally and Child Health: Cellular telephone technology is used for better delivery of health services worldwide. In low- and middle-income countries, they have used the mHealth application [7]. Cellular communication technology can reduce maternal health problems. Nevertheless, accelerating this goal requires pregnant women to have access to cellular phones [3]. Applying technology in health care can reduce maternal morbidity and improve survival in newborns [8]. Many women in countries worldwide access digital media information sources during their pregnancy [9]. The results obtained from several articles relating to the use of technology to improve maternal and child health stated that currently, the mHealth strategy significantly increases the proportion of women to be able to visit antenatal care recommended during pregnancy, and there is a tendency to improve the quality of care with preventive health services. More women attending antenatal care at the end of pregnancy and identified antepartum complications can be referred. Cellphone applications can contribute to improving maternal and infant health

DISCUSSION

This Scoping Review identifies 23 relevant publications that involve health information in pregnancy based on text messages, the benefits of cell phones in information retrieval during pregnancy, and the use of technology to improve maternal and child health. The findings show that the use of low-cost cellular telephone messages can potentially influence pregnant women's health behavior. Most pregnant women have accessed and are interested in receiving text messages containing health education information about pregnancy and infant health. Pregnant women benefit from the program to which most women have access. Most of them use internet access to get health information about fetal development and nutrition from the beginning of pregnancy. More than half of women think that the information they got is reliable 6.11. Seeing the enormous benefits of using technology-based applications in the search for information during pregnancy should even distribution of health information services

regarding the health of pregnant, maternity, childbirth, and family planning women be appropriately managed and given a source of information that is genuinely valid and can be managed by health professionals themselves.

When a pregnant woman looks for information about her pregnancy and delivery later, the pregnant woman will get accurate information. Besides, health professionals must ask more frequently about the information that the mother feels less clear. This is because current cell phone interventions significantly increase the proportion of women to conduct antenatal visits during pregnancy and there is a tendency for many pregnant women to receive preventive health services, and women who have emergency risks can be treated immediately

STRENGTHS AND LIMITATIONS: The topics taken in this scoping review enabled us to investigate what is currently known about the health information in pregnancy based on text messages, the benefits of cell phones in information retrieval during pregnancy, and the use of technology to improve maternal and child health. However, because all reviews need to be limited, the articles we take are only English articles. Articles mostly come from several countries so that the results may be generalizable. This article's weakness is because the research discusses the use of cellular-based applications that, on average, use the internet system; it will be tough to implement if it is done in remote areas that are far from the internet network. A further limitation of this research is only certain groups that may be motivated by the existence of cellular-based information. It is considering that age, education, and maternal work can make this study bias.

CONCLUSIONS

The findings outlined here provide some cellular-based health information in pregnancy that can increase the pregnant women's knowledge about pregnancy problems and how to care for their babies later they find in digital media. Cellular-based text messaging services have the potential and are useful for increasing recommended ANC visit coverage. Messages sent through the mobile application also have a positive impact on maternal and child health behavior.

Author Agreement: This article is the original work of AnisyaSelvia and DwiErnawati. All authors have seen and

agreed manuscript submitted. The authors comply with copyright provisions. This article has never been published or sent for publication at another place.

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