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REVIEW ARTICLE

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Use of Mobile Technology for Antenatal Services in Asian Countries

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ABSTRACT

The use of application-based mobile technology is widespread in Asian countries, but information related to its use for antenatal care is still minimal. This study aimed to describe the use of mHealth in antenatal care services in Asian countries. This study was a systematic review, which was sourced from several databases, namely Pubmed, ProQuest and Ebsco. The selection of articles was carried out using the Zotero application. The selection of articles was based on the PICOS criteria (population, intervention, comparison, outcome, and study design). The population criteria were pregnant women; intervention was mobile technology; no comparison; outcome was success in antenatal care; study design was qualitative and quantitative. Furthermore, a synthesis was carried out on the articles obtained based on the study objectives. The results of the study showed that: 1) The mHealth technology used includes simple technology to modern technology, namely mobile phones and smartphones; 2) Most mHealth was used for promotive efforts, but some are for preventive and curative efforts; 3) The benefits of mHealth in antenatal care services were to facilitate services, improve the quality of communication, reduce the frequency of visits to the clinic, and are feature-rich and highly applicable. Barriers to the use of mHealth include limited mobile phone ownership, internet connection, operator availability, lack of information, limited information technology, and service costs. The use of mobile technology in antenatal care in Asian countries was divided into 3, namely the use of SMS in low-middle income countries; the use of applications in high-middle income countries; and the use of applications and telephones for high-income countries. It was concluded that the use of mHealth technology in antenatal care services is more widely used for promotive efforts.

Keywords: antenatal care; promotive efforts; mobile technology; smartphone

INTRODUCTION

Antenatal care (ANC) is a good strategy to improve maternal health services in health care facilities. The presence of mobile-based applications for ANC services greatly assists managers in monitoring and improving compliance of pregnant women to follow ANC services, so that it is hoped that maternal mortality rates can be reduced. In 2017, there were more than 325,000 health applications available for ANC services. These applications support the delivery of health information, motivational messages, compliance monitoring, and encouragement for behavioral change. Application content can be adjusted to customer demographic characteristics such as gestational age, maternal age, language, risk factors and so on.⁽¹⁾ The applications currently available include family planning, ANC, intranatal care (INC), postnatal care (PNC), as well as neonatal and infant care.⁽²⁾ Applications for ANC services can also be connected to various devices such as cameras, glucometers, fitness activity trackers, Kegel exercises, fetal heart rate monitors, and other monitoring equipment. (1) The increasing penetration of cellular networks opens up new opportunities to enable coordinated, accessible, safe, and effective health care; support evidence-based service practices; facilitating community-based health services; and enabling the wider community to access maternal and newborn health information.^(3,4)

The World Health Organization (WHO) identified that "mhealth" initiatives are used in several countries in the form of computer-based applications designed to be operated on mobile devices such as mobile phones and tablet computers to access information, monitor fetal development, and track various individual health indicators.^(1,5,6) One study reported that the use of mobile phones had a positive effect on maternal weight control by providing guidance, reminders, and materials on health education.⁽⁷⁾ Another study reported that mhealth can be used to improve maternal compliance in consuming nutritional supplements during pregnancy in order to improve nutritional status during pregnancy and during the postpartum period.⁽⁸⁾ mHealth is very suitable to

support the design of patient-centered health services, which increase the role of patients in medical care and encourage increased self-management, which is very important for long-term chronic conditions.⁽⁹⁾

Mobile technology support in health services is generally used more in developed countries than in other countries such as Asia and Africa. The minimal use of this technology is caused by several factors, such as limited internet access, minimal research activities in the field of health education and health promotion, low quality of health care information and low levels of curiosity about health.⁽⁹⁾ Meanwhile, another study found that application-based mobile technology is more dominantly used in Asian countries, namely 80%, while in European countries it is 75%, the Eastern Mediterranean is 66.7% and America is 59.7%.⁽¹⁰⁾

Based on the background above, a study is needed that aims to describe the use of mobile technology in ANC services in Asian countries.

METHODS

This study was conducted using a systematic literature review method. The framework used as a reference in this study was the protocol from Strach & Sofaer (2012), (10) which was applied in the following steps: 1) Determining systematic review questions and inclusion/exclusion criteria; 2) Identifying relevant articles; 3) Conducting extraction and synthesis; 4) Presenting results. (11) Questions were arranged based on PICO (population, intervention, comparison, and outcome). Meanwhile, article selection was based on PICOS criteria (population, intervention, comparison, outcome, and study design). The population limitation was pregnant women; intervention was mobile technology; comparison was none; outcome was success in ANC services; study design was qualitative and quantitative. Article screening was carried out on three databases, namely PubMed, ProQuest and Ebsco. Article selection was carried out using the Zotero application. The article search process is described in the PRISMA Flowchart shown in Figure 1. The tool used to assess the quality of this article was the Joana Briggs checklist from the Joana Briggs Institute (JBI).

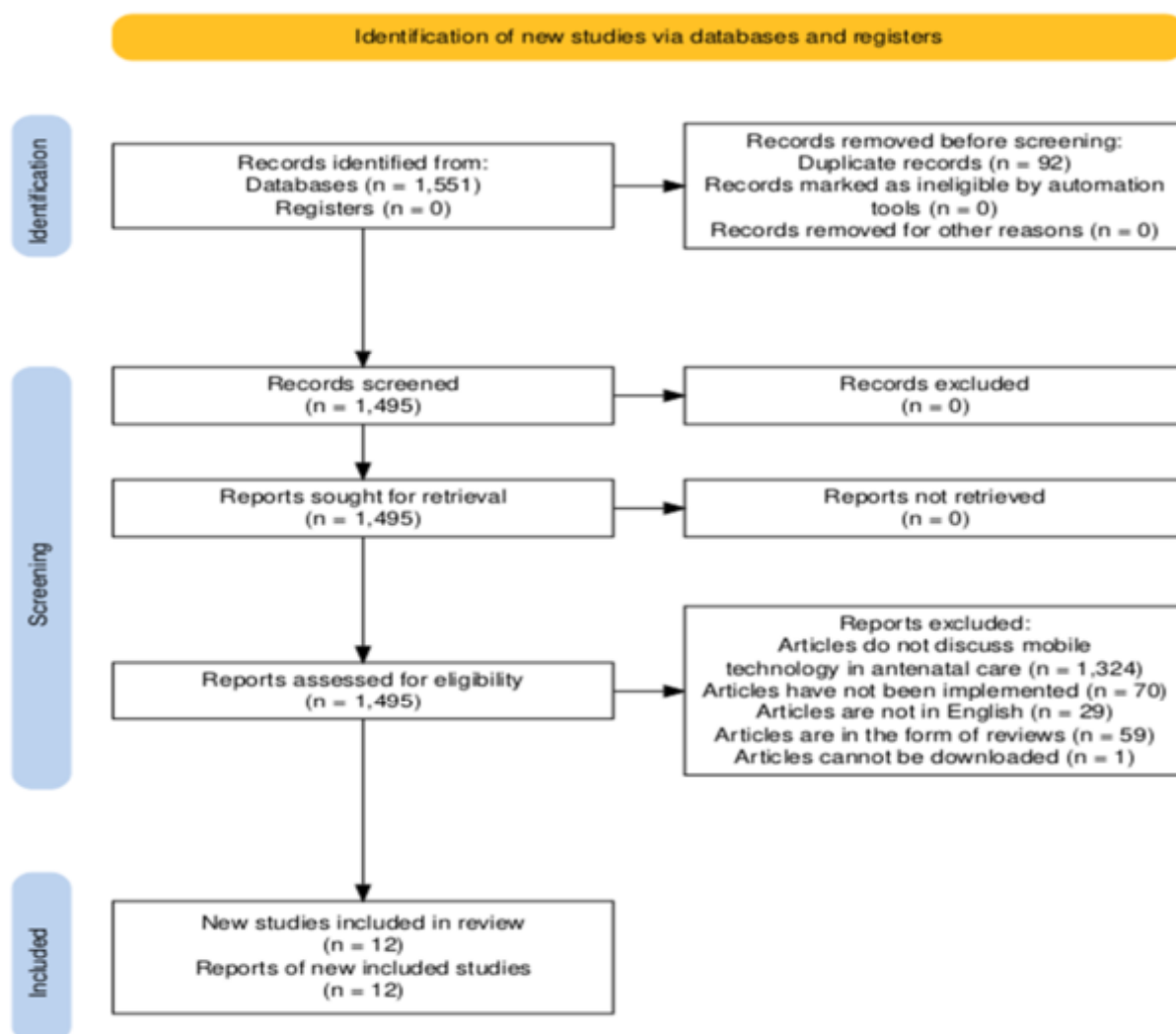


Figure 1. PRISMA flowchart ⁽¹²⁾

RESULTS

Based on the selection process from three databases totaling 1551 articles, 12 selected articles were obtained (Figure 1 PRISMA flowchart). Below are the results of the article review based on the characteristics of the research method and country.

Characteristics of Articles

The following are the characteristics of articles based on research methods in a systematic review. Based on a review of 12 articles, there were 9 quantitative studies and 3 qualitative studies (Figure 1). The following are the characteristics of articles based on the country (Figure 2). This study was conducted in Asian countries and researchers classified into 3 parts of the country based on income, namely: 7 articles Lower-middle-income economies including Timor Leste, Bangladesh, Pakistan. 2 articles Upper-middle-income economies from China. 3 articles High-income economies including Japan, Israel, South Korea In the results of the systematic review, researchers grouped the research results.

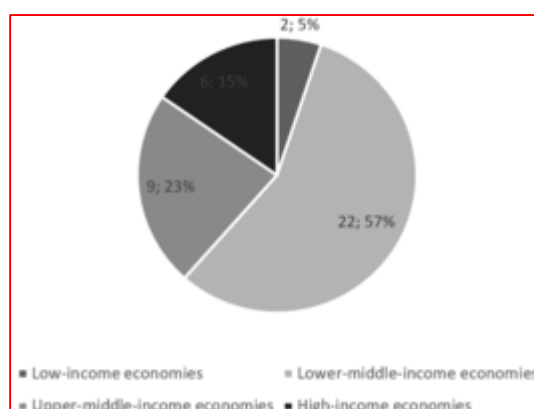
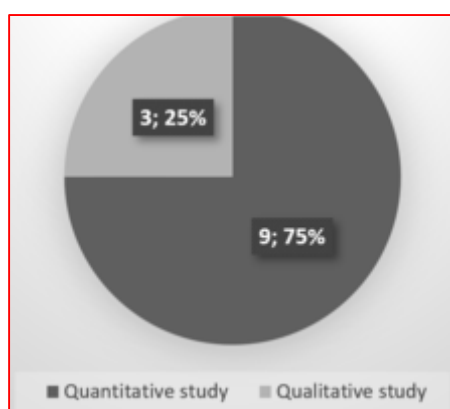


Figure 1. Characteristics of articles based on methods Figure 2. Characteristics of articles based on country

mHealth Technology

The mHealth technology that discussed here was divided into two, namely: mobile phones, smartphones. Mobile phones are electronic telecommunication devices that can be carried anywhere, do not need to be connected using cables and function to make and receive calls, also have the function of sending and receiving short messages/SMS. Smartphones are multipurpose devices, with stronger hardware capabilities and extensive mobile operating systems, can use the internet (web browsing), function multimedia (voice messages, email), telephone and short messages/SMS .

Mobile phone technology was found in 6 articles including A1, A2, A3, A8, A9, A11. The media used in the 6 studies were voice message, SMS and telephone features on mobile phones. 2 studies only used SMS for intervention. 3 studies used SMS together with voice messages. While 1 study used telephone to provide health care education and information. Most studies used "Push" technology where participants received personalized text messages or automated voice messages sent to their mobile phones that were tailored to their health needs and personal preferences. Studies that use two-way communication can encourage participants to use mobile phones to ask questions.

Findings in studies related to the use of mHealth technology using smartphones were obtained in 6 articles including A4, A5, A6, A10, A11, A12. The media used in the 6 studies used Android software and IOS software. 2 articles used additional telephone media, 3 used the mHealth application and 1 used a website

mHealth Service Program

Findings in studies related to health promotion obtained 8 articles. Only two articles A5, A11 discussed problems in health information due to cultural, social and economic belief factors. Health information in the form of services and knowledge about pregnant women, childbirth and postpartum is discussed in A1, A3, A5, A8, A9, A10, A11. Information about antenatal and postpartum depression in A7. Regarding the level of utilization of health information through mHealth, those who have mobile phones and who use them routinely are more likely to be open to receiving information than those who do not have or use them routinely. Health education information is presented in the form of material that is implemented in text, voice messages and videos. Health Education is usually designed from recommendations from WHO, UNICEF and the Ministry of Health.

Findings in studies related to preventive efforts were obtained in A4 discussing remote examinations to reduce the spread of Covid-19. Findings in studies related to curative efforts were obtained in A6 regarding medical services through online consultations.

mHealth Success

Findings in the study related to the benefits and barriers of using mHealth technology for maternity services, including in Table 1.

Table 1. Research synthesis related to the benefits and barriers to using MHealth

Code	Benefits	Code	Problem
A1	The mobile technology is supported by a web-based application hosted online and connected to a GSM gateway (a system that allows sending and receiving Short Message Service). This service is accessed via the internet and allows for the customization of scheduled outgoing weekly messages, monitoring program performance, and viewing registrations. ⁽¹⁴⁾	A1	Poor families are less likely to have mobile phones and are therefore less likely to benefit from mHealth programs. ⁽¹⁴⁾
A2	Mobile technology to the system calculates gestational age and automatically schedules four antenatal care (ANC) visits. ⁽¹⁵⁾	A2	Mobile phone ownership in the community, network connectivity and Public Health personnel to manage large-scale operations must be considered as important aspects. ⁽¹⁴⁾
A3, A8, A9	The Aponjon mHealth service has been developed, implemented and collaborated with Global MAMA (Mobile Alliance for Maternal Action) and pregnant women can choose the service they will use such as voice messages or text messages. ⁽¹⁵⁻¹⁷⁾	A3	Low subscription rates in slums. ⁽¹⁵⁾
A4	The service using the hospital website can help pregnant women with complications to safely undergo remote prenatal check-ups and medical care. ⁽¹⁸⁾	A5	Illiteracy, social exclusion, culture (shamans) and distance are causes of lack of information. ⁽¹⁹⁾
A5	Those who use ICC can update their own information using ICT, the information they share on ICC has validity and authenticity. ⁽¹⁹⁾	A6	Communication Using email interventions does not always result in an immediate response from the doctor. ⁽²⁰⁾
A6	Can improve the quality of communication and can reduce clinic visits. ⁽²⁰⁾	A7	Using the service for more than 30 minutes can cause depression, because it is immersed in the internet world. ⁽²¹⁾
A7	The acAPP design is always updated, the application contains a disease screening function, designed to monitor and intervene in antenatal depression. ⁽²¹⁾	A8	Services use fees. ⁽²²⁾
A10	The application is equipped with several features and tools. ⁽²³⁾		
A11	The intervention is designed with toll-free telephone communication. ⁽²⁴⁾		
A12	The application has more than one function. ⁽²⁵⁾		

DISCUSSION

mHealth Technology

One of the efforts to facilitate the implementation of patient and family self-management is through the use of health information technology, especially for remote treatment or monitoring (telemedicine or telemonitoring). Telemedicine or telemonitoring can be in the form of a pure internet-based application (eHealthcare) or combined with the use of mobile devices as a supporting tool.⁽¹⁴⁾ This system combines e-Healthcare with mobile health (mHealth) because the system for recording notes and reports from patients or families can use mobile devices, such as smartphones or tablet computers connected to the internet network.⁽¹⁵⁾

The mHealth technology used in several articles ranges from simple to more modern technology, namely cellphones and smartphones. The system software used is IOS and Android. The mHealth technology that will be discussed here is divided into two, namely: cellphones, smartphones. A cellphone is an electronic telecommunications device that can be carried anywhere, does not need to be connected using cables and functions

to make and receive calls, and also has the function of sending and receiving short messages/SMS.⁽¹⁶⁾ Smartphones are multipurpose devices, with stronger hardware capabilities and extensive mobile operating systems, can use the internet (web browsing), function multimedia (music, video, camera and games, along with the core functions of mobile phones such as telephone and short messages/SMS.⁽¹⁷⁾

mHealth Service Program

The development of a mobile health service program for the world of health is none other than to facilitate the performance of health workers in the field.⁽³⁾ The ease of using a new system depends on the user who uses it. In terms of ease, what is meant here is how this Android application is easy to understand, easy to learn and easy to use later by the user. The innovative use of mHealth has contributed to improving health in several developing countries such as Pakistan, India, Bangladesh and Botswana. The mHealth program is felt to be beneficial by parents, especially those with limited resources, although it is not a substitute for health service visits.⁽¹⁸⁾

Findings in studies related to the function of using mHealth are seen from the mHealth service program, namely health promotion, preventive and curative. In this study, the most frequently found is health promotion. The use of technology allows for the dissemination of information to patients or service users in an effort to improve health services.⁽¹⁹⁾ mHealth applications include communicating health information, adherence to treatment, and reminders for scheduled visits.⁽²⁰⁾ Previous studies also mentioned that the use of m-Health applications resulted in increased knowledge about health care, influenced attitudes and changes in patient behavior, thereby improving health.⁽²¹⁾

Success of mHealth

Based on findings in studies related to the benefits of using mHealth technology for maternity services. Researchers summarize the benefits of using mHealth technology, namely Facilitating health services, Improving communication quality, Reducing clinic visits and Applications are very applicable and have many features. Findings in the study related to obstacles during the use of mHealth technology for maternity services, including limited mobile phone ownership, network connection, operator availability, lack of information, IT limitations, service costs.⁽²²⁾

There is research showing that the use of m-health helps decision making at the right time and creates stronger relationships with policy makers to act. This is a driver for health workers to provide better further health service actions.⁽²³⁾ Research conducted by Mengesha, et al shows that with the use of m-health, health workers can be given and provide follow-up warnings so that they are able to detect patients who may have been absent due to health system challenges (no follow-up/poor recording) or inequities that hinder access to services (disability, geography, gender inequality and/or financial constraints). Through these warnings, health workers can follow up on patients in a responsive and timely manner.⁽²⁴⁾ Other studies have also revealed that m-health systems can provide risk marker warnings for immediate intervention and further action.⁽²⁵⁾

Limitation

This systematic review has several limitations, including that the coverage area is not too wide, namely in Asian countries so that the findings cannot be generalized internationally. In addition, more than 12 articles use cross-sectional research methods which are considered less representative of measurements, and only analyze during certain periods.

CONCLUSION

Based on the study, It was concluded that the use of mHealth technology in antenatal care services is more widely used for promotive efforts.

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