

# Acceptance of Mobile Technology in Antenatal Care (ANC) Services: A Systematic Review

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## ABSTRACT

Mobile technology is an innovation to improve the outcomes of health care and services. Information technology is always related to user acceptance to determine its level of success. The study aims to systematically review scientific evidence related to the acceptance of pregnant women towards technology in ANC services. The search was carried out comprehensively using three databases Pubmed, EBSCO, ProQuest, from January 1, 2010, to November 30, 2020, following the PRISMA 2020 guidelines. The study results found seven articles that met the inclusion criteria with acceptance factors identified in the findings: performance expectancy, effort expectancy, social influence, and facilitating conditions.

**Keywords:** Pregnant mothers; Acceptance; Mobile technology

## INTRODUCTION

Mobile technology (mHealth) as a health care sector worldwide is becoming popular rapidly (1). ANC services indicate access to health services for pregnant women and the level of compliance in checking their pregnancy condition (2). One form of using technology in good health services can be seen from pregnant women's compliance in conducting ANC visits. According to government policy, standard indicators of coverage of ANC visits in Indonesia are carried out at least four times during pregnancy (3). Previously, WHO recommended four ANC visits for

uncomplicated pregnancies. However, WHO now recommends a minimum of eight visits to improve neonatal outcomes and provide a more positive, female-centered experience (4).

Changes and technological developments that are increasingly advanced in the 21st century can provide quality ANC services to help improve the MCH program (5). Technology makes it easy to get various information about ANC services easily obtained and accessed (6).

Information and communication technology can help facilitate access to health services by overcoming various obstacles faced such as social, cultural, economic, geographical or other problems (7). Today, the Coronavirus (COVID-19) pandemic has hit all corners of the world, hating face-to-face ANC service activities directly to health facilities. Thus, mobile technology is used as a communication tool to improve MCH services during the COVID-19 pandemic and before (8).

Despite the high expectations regarding using technology in the health system is not easy (9). The implementation of information technology is always related to user acceptance. The extent to which users can accept and understand the technology is important to know the technology's success. User acceptance is an important factor that affects the successful implementation of a technology (10).

## RESEARCH METHODS

The steps for preparing a systematic review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 reporting method.

### Eligibility Criteria

The articles were identified using the PICO framework to identify key concepts in the review's focus (11). The research included in this review was an original/peer-reviewed article explaining the acceptance of mobile technology implemented in ANC services in ASIA Continental Countries, published from January 1, 2010, to November 30, 2020, written in English and Indonesian.

### Search Strategy and Information Resources

A literature search used PubMed, ProQuest, and EBSCO databases focusing on an extended framework by specifying synonyms via thesaurus and Boolean operators (AND, OR, and NOT) to combine or exclude keywords in the search, resulting in more focused and relevant results in PubMed adopted and adapted to other databases. The search strategy began by developing keywords through discussions between researchers and experts focusing on “acceptance”, “mobile technology,” and “antenatal”. A list of keywords used as the basis for a broader literature search is detailed in Table 1.

**Table 1. Keywords systematic review**

No	Keywords	No	Keywords
1.	Accept*	57.	SMS
2.	Perspective*	58.	"Short Message Service"
3.	Opinion*	59.	Application
4.	Suggest*	60.	Applications
5.	Predisposition	61.	"Mobile Health"
6.	Wish	62.	Mhealth
7.	Interest*	63.	"Mobile Applications"
8.	Encouragement	64.	"Smartphone App"
9.	Desire	65.	"Text Messaging"
10.	Motivation*	66.	"Mobile Devices"
11.	Character*	67.	"Text Messages"
12.	Attitude*	68.	"Mobilehealth Application"
13.	Mindset	69	"Mobile Phone-Based"
14.	View*	70.	"Mobile Phone Messaging"
15.	Reaction*	71.	36 OR 70
16.	"Point Of View"	72.	Antenatal
17.	Belief*	73.	"Ante Natal"
18.	Settlement	74.	Pregnant
19.	Well-Being	75.	Pregnancy
20.	Pleasure	76.	Pregnant

21.	Happiness	77.	Prenatal
22.	Happy	78.	Trimester
23.	Enjoy*	79.	Maternity
24.	Comfort*	80.	Maternal
25.	Ethic*	81.	Ante-Natal
26.	Satisfaction	82.	Pregnancies
27.	Moral	83.	Antenatally
28.	Habits	84.	Prenatal
29.	Expression	85.	Perinatal
30.	Action*	86.	72 OR 85
31.	Performance	87.	Animal
32.	Prospect*	88.	Mice
33.	Behavior	89.	Mouse
34.	Behaviour	90.	"Mus Musculus"
35.	OR 1-34	91.	Rat
36.	"Mobile Technology"	92.	"Rattus Norvegicus"
37.	"Mobile Phone"	93.	"Guinea Pig"
38.	"Mobile Phones"	94.	"Cavia Porcellus"
39.	"Mobile Apps"	95.	"Cavia Cobaya"
40.	"Mobile App"	96.	Rabbit
41.	"Mobile Device"	97.	Leporidae
42.	Smartphone	98.	Goat
43.	Smartphones	99.	"Capra Aegagrus Hircus"
44.	"Smart Phone"	100.	Dog
45.	Smart-Phone	101.	"Canis Lupus Familiaris"
46.	Android	102.	Cat
47.	"Android App"	103.	"Felis Catus"
48.	"Android Apps"	104.	Monkey
49.	Apple	105.	Pig
50.	IOS	106.	Swine
51.	Iphone	107.	"Sus Domesticus"
52.	"Iphone App"	108.	"Sus Scrofa Domesticus"
53.	"Iphone Apps"	109.	Reptile
54.	Phone	110.	Lizard
55.	Cell-Phone	111.	87 OR 110
56.	"Cellular Phone"	112.	35 AND 71 AND 86 NOT 111

### Study Selection and Data Extraction

The steps in identifying relevant articles used Zotero reference management, making it easy to select duplicate articles (12). Two authors (KH and WS) carried out the selection process in screening titles, abstracts, and full text based on the eligibility criteria and developing a rubric table for data extraction. Each author analyzed the literature using an independently designed data extraction format, and any discrepancies came through discussion between the authors to ensure coherence of interpretation of the relevant data (13).

### Quality Rating

Quality assessment assesses the quality of articles which can assist in identifying biases and methodological weaknesses in research, thereby improving the quality of the review. The assessment of articles on

selected quantitative studies used a quality assessment from the Joanna Briggs Institute (JBI) (14). The authors assessed each article according to a checklist accompanied by an assessment of the quality of the article based on high, medium and low-quality categories: high quality (8-7), moderate (6-4), low (3-0), cross-sectional studies (15).

### Data Synthesis

Selected studies will be included in the review after going through a process of searching for relevant articles (16). Data from the included studies are described and presented narratively, an approach that relies on text and words to summarize findings (17).

## RESULTS AND DISCUSSION

### Search Strategy

Details of the results from the literature search and screening process are shown in Figure 1. After deleting duplicate articles, a total of 1210 articles were screened. According to inclusion criteria, the authors (KH, WS) independently screened titles, abstracts, and full text. After that, the results obtained entered the abstract screening stage with 574 articles. Full-text screening obtained 257 articles, then filtered or analyzed using a rubric table according to the data extraction format. The authors discussed seven articles, and the results obtained from the screening process followed the eligibility criteria.

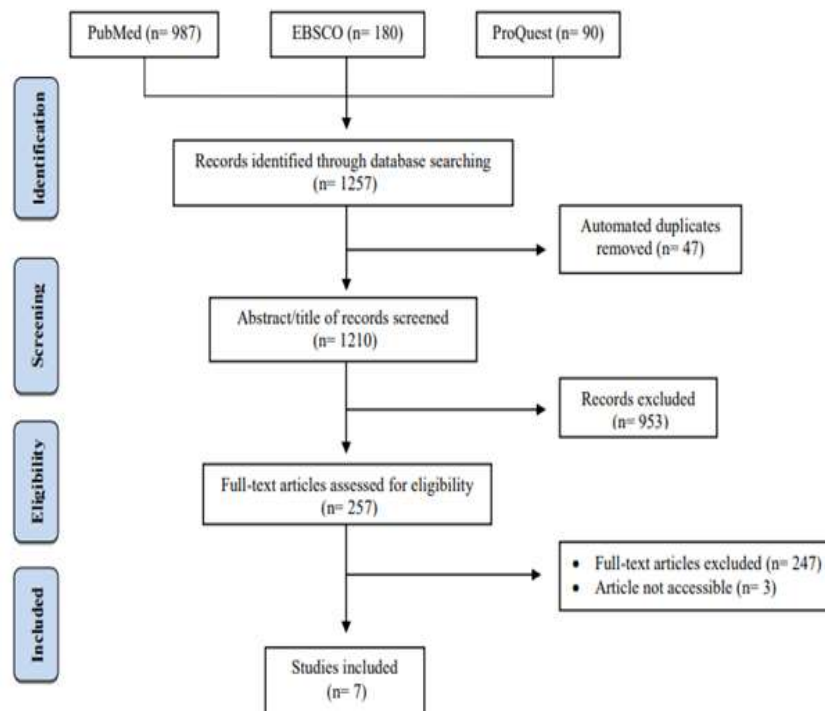


Figure 1. PRISMA flow diagram of study selection

### Characteristics of Study

The selected articles' characteristics (Table 3.1.) included were published in international journals from January 1, 2010, to November 30, 2020 (Figure 3.2.). Selected article countries included Jordan (n=1), Israel (n=1), Bangladesh (n=2),

Timor-Leste (n=1), China (n=1), South Korea (n=1), based on a cross-sectional research design study (n=7) accompanied by various mHealth programs such as telephone, SMS, email and applications related to the provision of ANC services.

**Table 2. Characteristics of Selected Studies**

No.	Author, Year	Country	Design Studies	mHealth Programs and Benefits	UTAUT Model Technology Acceptance
1.	Davidenko <i>et al.</i> (2014)	Israel	Cross-sectional	Phone or email Improving health services, thereby reducing clinic and emergency room visits Improving the quality of the doctor-patient relationship Providing consultation in real-time	<i>Performance Expectancy, Facilitating Conditions</i>
2.	Lee & Moon. (2016)	South Korea	Cross-sectional	<i>Messenger apps</i> Improving health services	<i>Effort Expectancy, Facilitating Conditions</i>
3.	Mo <i>et al.</i> (2018)	Cina	Cross-sectional	<i>Antenatal care apps (acAPPs)</i> Channeling information Giving interpersonal interaction Providing health consultation and psychological guidance Providing pregnancy management	<i>Performance Expectancy, Facilitating Conditions</i>
4.	Thompson <i>et al.</i> (2019)	Timor-Leste	Cross-sectional	Liga Inan (Mobile technology supported by the web-based application) Receiving services and information about ANC and postnatal visits Helping with skilled birth attendants and delivery in health facilities	<i>Facilitating Conditions</i>
5.	Chowdhury <i>et al.</i> (2019)	Bangladesh	Cross-sectional	Aponjon (Application that supports text messages or voice messages) MCH services Quality data and information (real-time, fast and timely) Information about pregnancy and postpartum Nutrient intake	<i>Performance Expectancy, Facilitating Conditions</i>
6.	S. Nasir <i>et al.</i> (2020)	Jordan	Cross-sectional	e-MCH Handbook Improving health services and efficiently monitoring the community Providing access offline and online to get the latest information Providing mother and child's health records	<i>Performance Expectancy, Social Influence, Facilitating Conditions</i>
7.	Alam <i>et al.</i> (2020)	Bangladesh	Cross-sectional	Aponjon (Application that supports text messages or voice messages) MCH services Quality data and information (real-time, easy, fast and timely) Information about pregnancy and postpartum Clean and healthy lifestyle	<i>Performance Expectancy, Facilitating Conditions</i>

### Quality Rating

Assessment of the quality of 7 articles using the JBI checklist found results from a cross-sectional design study with high quality (n=1) and moderate-quality (n=6).

### Performance Expectancy

The results of relevant research studies regarding the relationship of performance expectancy significantly influenced behavioral intention, stating that technology is useful in everyday life in receiving faster services. Providing maternity care services and obtaining information about pregnancy allows pregnant women to learn about prenatal care without the limitations of time, work, transportation, and network coverage.

The researchers found that they perceive technology as a useful source of information (18) (19) (20) (21) (22) (23).

### Effort Expectancy

The findings from this review are that effort expectancy has a relationship with the acceptance of the technology. The findings state that an application can be accepted by its users when it is practical to access (23).

### Social Influence

The review results obtained that social influence, one of which is the surrounding environment or husband's support, can influence the wife's behavior to use mobile internet in achieving the successful mHealth

intervention since this service provides online and offline access to pregnant women and mothers to obtain educational and educational information health records (22).

### **Facilitating Conditions**

The review results are related to the acceptance of mobile technology in facilitating conditions. In some cases, such results have the necessary resources to use the mobile internet, especially the importance of the wide availability of mobile phones and network coverage for respondents as a means of communication that can help access health services easily (21) (18) (19) (24) (25) (20) (26) (23) (22) (27). Providing a doctor's cell phone number or email address and guidelines and resources that can improve health services (18).

Likewise, it is necessary to get help from others when having difficulty using or getting access to cellular internet by lending cellphones to women from underprivileged families during the service period and special training for clients to use the mHealth program. The successful mHealth intervention must also be supported by knowledge of an application, and users must have access to the internet (21) (22) (20).

### **DISCUSSION**

Today, many people can access mobile technology easily. Previous studies have described the mobile phone access experience as receiving health-related services (28). Moreover, technological assistance can be accessed in the health sector, making it easier to assist in health processes and services (29).

Various theories or models of information systems are developed to study the adoption of specific new technologies. One of the most used and validated models in empirical studies is the Unified Theory of Acceptance and Use of Technology (UTAUT) framework model (30). UTAUT is a model to explain user acceptance of information technology. UTAUT has four core factors that determine the intention to study the

acceptance and use of technology, such as performance expectancy, effort expectancy, social influence and facilitating conditions (31). The UTAUT model has been widely carried out and has succeeded in explaining up to 70% of user behavioral intentions in adopting technology compared to eight other technology acceptance theories (32). However, the variable development of the UTAUT model varies according to the needs of the research context (33).

This SR research analysis revealed that user intentions influence health technology. Almost all researchers stated that behavioral intention influenced the acceptance of mobile technology. In connection with that, the selection of variables in this study was based on the affirmation of some of these researchers by looking at the level of significance of the research variables, then adjusting to the conditions or research needs of identifying mobile technology acceptance in ANC services. The findings of the article analysis included variables from UTAUT and those identified in research with an influence on the adoption of technology, such as performance expectancy, effort expectancy, social influence, facilitating conditions. Research in developing countries such as Bangladesh confirms that applying the UTAUT model in mHealth services provides valuable information for mHealth service providers and policymakers in understanding adoption challenges and problems and provides practical guidance for successful implementation of mHealth services (34).

The limitation of this SR is that the review results are a few because the articles obtained only studied and discussed the technology in the health sector around the concept, development or trial of the technology, while the articles included in the research criteria were technologies that have been implemented.

### **CONCLUSION**

From the evidence-based literature review results in this review, factors with a role in influencing the acceptance of pregnant

women to the technology in ANC services are expectancy performance, social influence, and facilitating conditions. Based on the findings, which has a greater role, namely facilitating conditions because users believe that if there is a system that supports it, including coverage, network and availability of devices (cell phones), the individual's intention to use mHealth applications will be greater in accepting a technology.

Most studies reported the feasibility and positive user acceptance of mobile technology for pregnant women because it provides many benefits in providing equitable health services among pregnant women in all regions, especially areas that are difficult to reach by health workers.

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