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Effectiveness of E-Health for Early Detection of Emergency in Pregnancy : A Systematic Review

Nuke Devi Indrawati[1,2]*, Meti Patimah[2,3], Rahayu Widaryanti[3,4], Martha Irene Kartasurya[2]

[1]Universitas Muhammadiyah Semarang, Indonesia
[2]Universitas Diponegoro, Indonesia
[3]Universitas Muhammadiyah Tasikmalaya, Indonesia
[4]Universitas Respati Yogyakarta, Indonesia

Abstract

Background: The rapid development of digital technology provides a fundamental new understanding of improving public health by utilizing digitalization, especially in health prevention and promotion. The aim of this systematic review is to determine the effect of E-Health for Early Detection of Emergencies in Pregnancy. Method: This research was conducted using a systematic review referring to the 2020 PRISMA checklist. The article search process used databases sourced from PubMed, Scopus, Cinahl and Science Direct, using keywords and inclusion and exclusion criteria. The literature search used several keywords, namely “digital technology in health”, “digital services”, and “digital public health” in 2012-2022. Results: In searching this journal, researchers found 5 (five) pieces of literature related to digital health services. The research results showed that various digital applications were used to provide health services such as m-health and digital healthcare for pregnant women based on Android which were used to provide pregnancy services, knowledge and attitudes towards weight gain guidelines, weight tracking. Conclusion : Medical applications make smartphones a useful tool in the practice of evidence-based medicine at the point of care, and can also play a very important role in patient education, disease self-management, and remote patient monitoring.

Keywords

application; early detection; emergency; pregnancy

*__Corresponding Author__: Nuke Devi Indrawati (E-mail: nukedevi@unimus.ac.id)

Introduction

The delivery of efficient and high-quality health services is a cornerstone of the global agenda to achieve universal health coverage. According to the World Health Organization (WHO), health service delivery is considered good when equitable access to a comprehensive range of high-quality health services is guaranteed within an integrated and person-centred continuum of services (WHO, 2010).

The rapid development of digital technology provides a fundamental new understanding of improving public health by utilizing digitalization, especially in health prevention and promotion (Wienert et al., 2022). In the last five years, the use of Information and Communication Technology (ICT) in Indonesia has shown rapid development. The most rapid development of ICT indicators can be seen in household internet use which will reach 86.54 percent in 2022 (Statistik, 2022).

The power of digital technology is critical to achieving universal health coverage, and digital technology is not the end goal; they are an important tool for improving health, keeping the world safe, and serving disadvantaged groups (Dempsey et al., 2020). Many software applications have been produced for healthcare professionals to facilitate evidence-based treatment practices at the point of care (Saleh et al., 2012). Digital technologies shape the way individuals and health systems interact to improve health and treat disease (Azzopardi-Muscat & Sørensen, 2019).

Method

The author refers to the 2020 Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist as a reference in conducting a systematic review.

Search Strategy

The article search process was carried out using research questions with the PICO (Population, Intervention, Comparison and Outcome) approach. The search used the keywords “digital technology in health”, “digital services”, “pregnant women” and “digital public health”. Article searches using Google Scholar, Pubmed, Scopus and Science Direct for articles with quantitative and qualitative designs.

Inclusion and Exclusion Criteria

The expected results, the authors applied several inclusion and exclusion criteria. The inclusion criteria used were articles published from 5 literature publications in 2016-2022, fully accessible, containing applications for detecting emergencies in pregnant women. We excluded paid or restricted access articles, not in English and incomplete, for example articles that did not include an abstract.

Article Selection

The article selection process is carried out in 3 stages, NDI authors use the help of artificial intelligence Rayyan which is a free web-based online filtering tool to filter duplicates and delete articles based on irrelevant titles. In the second stage, the two MP authors carried out screening through Rayyan AI using a blind system so that the two reviewers did not know the results of the screening carried out by the other reviewer, the conflict was resolved by the third reviewer. After filtering duplicates and titles that are not relevant to the topic, the next stage is for the reviewer to review the abstracts that have passed the previous two stages together, then the articles that pass are selected for extraction. Article eligibility and the detailed screening process at each step are listed in the PRISMA diagram in Figure 1.

Data Synthesis

The authors report the results taking into account the interventions conducted that focused on postpartum women. The quite diverse research designs in the articles we collected caused quite high heterogenei-

ty so that meta-analysis was not possible. Therefore, the author summarizes the findings regarding the effectiveness of family planning counseling only in the form of a descriptive narrative and in a table containing a summary of the data that we can take from the selected articles. In this systematic review, the authors followed PRISMA guidelines without systematically assessing the

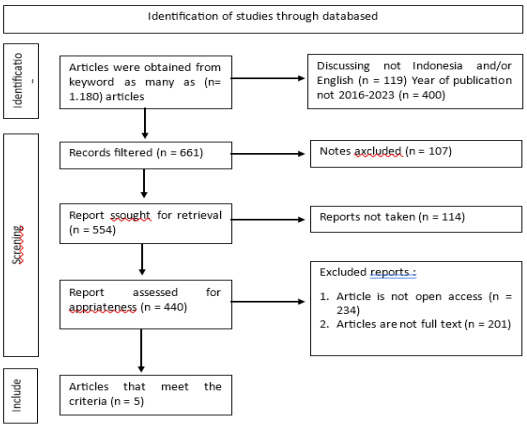

Figure 1. Article Search Diagram based on PRISMA

Result and Discussion

The search process using keywords in database sources on the internet produced a total of 1180 articles, the use of AI to detect duplicates including deleting systematic review articles that were netted in search engines produced 661 articles which were then filtered based on the title and abstract of the review. Based on the title and abstract review, 554 articles were excluded because they did not meet the research objectives and 440 articles met the requirements. Of the 440 articles, 234 articles were not fully accessible, 201 articles did not discuss postnatal family planning and 107 articles indicated inappropriate intervention, leaving 5 articles. The online data search strategy yielded 5 studies that were potentially relevant for research. Examining the abstracts, 5 studies were selected and the studies were reviewed as follows:

The current era is an era where there is unlimited exchange of resources, technological innovation and information (Malik, 2019). The spread of these diseases depends on producing quality low-cost diagnostic equipment for disease screening, making vaccines and essential drugs available to everyone, developing good storage systems for drugs and vaccine reagents, and creating awareness about the disease and health through various media platforms. Recently, as the world is struggling to overcome this pandemic, every appropriate or innovative technology discovered or discovered is being disseminated to maximize health benefits and minimize loss of life (Technologies & Programme, 2019).

Based on (Saleh et al., 2012) explains that many medical applications for smartphones have been developed and are widely used by health professionals and patients. Medical applications make smartphones a useful tool in the practice of evidence-based medicine at the point of care, in addition to their use in mobile clinical communications (Hernández-Neuta et al., 2019). In addition, smartphones can also play a very important role in patient education, disease self-management, and remote patient monitoring. In research, Nawangsari et al., (2022), explains that a User Interface (UI) application prototype is the result of design. The prototype can be run as a web application as well as an android application (M. Prawira et al., 2019). This midwife salute prototype can be accessed at url: http://haibidann.com/http://haibidann.com/ and for the Android application it is available with haibidan.apk.

Access via a web browser with the URL will be displayed on the website display directly on the cloud hosting and access via the application installed on the Android device will be displayed on the application display. However, with web view and cloud hosting technology, accessing and using applications becomes easier because users only send and receive data from cloud hosting (Koehler et al., 2020). This application has been tested using the Blackbox software testing technique approach. The type of BlackBox technique used is Use Case Testing. This use case is based on UML modeling created previously. In the test case, user login is used (Nawangsari et al., 2022).

In research (Reddy et al., 2022) describes the M-HEALTH application which explains (1) the recommended pregnancy period for starting

Table 1. Characteristics of Research Articles that Meet Inclusion Criteria

Author, Title, Year	Method (Design/ Population/Sample/ variables)	Research Results and Conclusions
A Critical Look at the Global Digital Divide and the Role of Technology in Health Care. (Reddy et al., 2022)	Desain Penelitian : Kuantitatif uji coba metode campuran	Of the 80 participants enrolled, 69 (86%) completed the study with a median follow-up period of 6 months. Women in the MatHealth group had odds of 8.2 (P ¼ 0.19), 3.6 (P ¼ 0.14), and 6.4 (P ¼ 0.25), respectively, of having higher odds of knowing (1) recommended gestational period for initiating ANC, (2) recommended number of ANC visits, and (3) recommended timing and frequency of human immunodeficiency virus (HIV) testing compared with the routine care group.
Descriptive, Qualitative Study of Women Who Use Mobile Health Applications to Obtain Perinatal Health Information. (Connor et al., 2018)	Research design: qualitative descriptive.	mHealth Apps Are a Source of Support During Childbirth, mHealth Apps Are Functional Tools, and There Are Limitations to mHealth Apps. Participants felt supported when they used mHealth apps because the information was personalized and they could use the apps to connect with family and online communities. mHealth apps have limitations because women sometimes feel disconnected from the information they receive, some health care providers and families do not support their use, and and safety issues may be a concern.
Design of Mobile Digital Healthcare Application For Pregnant WomenBased on Android. (Nawangsari et al., 2022)	Research Design: The ADDIE framework model consists of five parts, namely analysis, design, development, implementation and evaluation.	A User Interface (UI) application prototype is the result of the design. The prototype can be run as a web application as well as an android application. This midwife salute prototype can be accessed at url: http://haibidann.com/http://haibidann.com/ and for the Android application it is available with haibidan.apk. Access via a web browser with the URL will be displayed on the website display directly on the cloud hosting and access via the application installed on the Android device will be displayed on the application display. However, with web view and cloud hosting technology, accessing and using applications becomes easier because users only send and receive data from cloud hosting. This application has been tested using the Blackbox software testing technique approach. The type of BlackBox technique used is Use Case Testing. This use case is based on UML modeling created previously. In the test case, user login is used. These results indicate that the user login function is running well according to design.
Development and pilot evaluation of a pregnancy-specific mobile health tool: a qualitative investigation of SmartMoms Canada. (Halili et al., 2018)	Research Design: qualitative descriptive.	Participants were technologically savvy and interacted with several mHealth tools before testing the SmartMoms Canada app. Six main themes emerged from the thematic analysis: knowledge of pregnancy-specific mHealth services, knowledge and attitudes towards weight gain guidelines, weight tracking, strengths of the app, criticism, and finally, future suggestions for the app.
Effects of Social Media and Mobile Health Apps on Pregnancy Care: Meta-Analysis. (Chan & Chen, 2019)	Research Design: Comprehensive literature study	fifteen randomized controlled trial studies published in and before June 2018 that met the inclusion criteria were included in the meta-analysis. The intervention was effective in improving maternal physical health including weight management, control of gestational diabetes mellitus, and asthma control with moderate to large effect sizes (d=0.72). A large effect size was also found in improving maternal mental health (d=0.84) and knowledge about pregnancy (d=0.80). Weight control interventions using wearable devices are more effective.

ANC, (2) the recommended number of ANC visits, and (3) the time and frequency of human visits. recommended immunodeficiency virus (HIV) testing compared with the routine care group. So all women in the MatHealth App group breastfed their babies exclusively, and had their babies tested for HIV at 6 weeks of age, compared with the routine care group. More than half of the women attended at least 4 prenatal visits in both groups.

Users search more for mHealth apps for pregnancy than other health condition-related apps, likely because women of childbearing age are comfortable with technology, experience significant physiological changes during pregnancy, and often seek information and guidance (Tseng, 2016). (Kim & Park, 2012) found that women who used an mHealth app journal versus a spiral notebook journal during pregnancy were more likely to carry the journal during perinatal visits and rated communication with their care providers higher during their pregnancy.

Research from (Wang et al., 2019) surveyed 535 women and showed that the most common reasons women used applications were to monitor fetal development (83%) and to obtain information about nutrition (26.2%) and antenatal care (23.9 %). Research (Lee & Moon, 2016) evaluated 47 apps identified by surveying 193 women and reported that most women decided to download the app after evaluating the content themselves (61.7%), and the most frequently cited benefit was convenience (35.8 %), while the most common weakness was lack of credibility (39%).

M-Health Apps Are Functional Tools, and There Are Limitations to mHealth Apps. Participants feel supported when they use the M-Health app because the information is personalized and they can use the app to connect with family and online communities. The M-Health app has limitations in that women sometimes feel disconnected from the information they receive, some health care providers and families do not support its use, and and security issues may be a concern (Frid et al., 2021).

Conclusion

This era is an era where there is widespread exchange of resources, technological innovation and information without national borders. Medical apps make smartphones a useful tool in the practice of evidence-based medicine at the point of care, and can also play an important role in patient education, disease self-management, and remote patient monitoring.

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