Review Article

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The Role of Information Systems in Early Detection of Pregnant Psychological Issue: A Systematic Review

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Abstract

Introduction: During pregnancy, there can be very critical psychological changes. Early detection with verbal and paper-based questionnaires has not been able to help. A fast and practical information system is used in health services to support the success of early detection of anxiety in pregnant women. **Objective**: This study aims to analyze the role of information systems in the early detection of the psychological health of pregnant women and recommendations for improving midwifery services. **Methods:** This study is a systematic review that uses the PRISMA protocol guidelines. The databases searched in this study were articles from PubMed, Google Scholar, and Science Direct. **Results:** There are four relevant articles reviewed in this study. Studies show that information systems effectively detect the psychological health of mothers during pregnancy. **Conclusion:** Overall, the research indicates that the information system is a platform that has a perceived impact on the psychological well-being of pregnant women. **Recommendation**: Further study need to be consider the information system to detect the issue of psychological among pregnant women.

Keywords: **p**regnancy, early detection, information system.

INTRODUCTION

Pregnancy is an important event for every woman (1). Pregnant women must be able to adapt to these physiological and psychological changes (2). During pregnancy, there can be very critical psychological changes. Mothers must be able to go through psychological changes so that the role of a mother can be achieved. If the mother fails, it can impact the disruption of the mother's psychological health (3).

During pregnancy, psychological health disorders in developed and developing countries are 10-25% (4). In pregnancy, psychological health disorders are associated with increased fetal heart rate, low birth weight, fetal distress, congenital malformations, premature labor, and delivery outcomes (5,6). Prevalence is high, but new studies report low levels of care (7). Efforts have been made to maintain maternal health during pregnancy is to perform Antenatal Care (ANC). (8) The results of previous studies showed that the more influential the ANC examination, the better the level of psychological health (9). Researchers suggest that giving ANC should meet pregnant women's needs with strategies to overcome psychological health problems (10). However, in the absence of routine and standardized early detection/screening related to the psychological health of pregnant women in community-based services in health facilities, psychological well-being problems for pregnant women will still exist. According to the National Health Service (NHS) in the UK, assessing maternal psychological health during pregnancy is usually carried out by verbal and paper-based questionnaires conducted in obstetric clinics, but manual system detection has not been able to help (11).

In this modern era, the development of information technology is increasingly advanced in all aspects of life (12). In recent years, the use of information system technology in health services (E-Health) has grown rapidly. There are 51% of people use the internet to find health information. Information system technology allows flexible access to health services, can be anywhere, anytime, saves travel costs, facilitates care, minimizes stigmatization, is more anonymous, and is more private, thereby increasing honest answers. In addition, information system technology can support decisions to seek health information, communicate more efficiently, and reduce the error rate in diagnosing (13).

The use of information system technology has been debated to overcome obstacles in providing early detection of psychological health. It is important to note that information systems can promise to avoid barriers to providing psychological health services to pregnant women. The information system has been utilized in previous studies, which showed that mental health screening with web-based e-screening was feasible and acceptable in providing mental health screening services. (14) Another study showed that screening using the Computerized Adaptive Test-Mental Health (CAT-MH™) survey results was 92% easy to accept, and 76% responded with very favorable comments (15).

OBJECTIVE

This systematic review aims to analyze the role of information systems in the early detection of the psychological health of pregnant women and recommendations for improving midwifery services.

METHODS

This research is a systematic review. The databases searched in this study were articles from PubMed, Google Scholar, and Science Direct. The articles included in this review are full-text articles in English published from January 2011 to August 2021.

This study used the PRISMA protocol guidelines (Preferred Reporting Items for Systematic Reviews and Meta-analyses). The initial stage of PRISMA is to identify articles based on keywords and then filter articles based on titles, abstracts, texts, references containing the selected terms. In this stage, the researcher assesses the relevant articles by thoroughly reading the article's contents and ensuring that the article is suitable for re-examination. Then perform data extraction and arrange it into a PRISMA diagram.

The keywords used were "pregnancy," "psychological health," and "information systems," "psychological health during pregnancy," "early detection of psychological health," and "early detection with information systems." To identify keyword searches developed based on the PICO framework

(Population, Intervention, Comparison, and Outcomes) to decide which articles need further review according to the research topic. (16) The search strategy focuses on journals in the last ten-year period. Where P (Population): Primiparous and multiparous pregnant women from the first trimester to the third trimester. (Intervention): the use of information systems for early detection of psychological health of pregnant women using the web, applications, or smartphone tools. C (Comparison):- O (Result): effectiveness of early detection of maternal psychological health during pregnancy with information systems. So the keywords used are pregnancy", "psychological health" and "information systems," "psychological health during pregnancy," "early detection of psychological health," and "early detection with information systems," "applications for early detection of psychological health," "early detection of web-based psychological health," "early detection of pregnant women with smartphones."

In addition, data was collected by selecting articles according to the inclusion criteria by looking at the title, tracing the information in the abstract, then reading the full text. All article searches are limited to articles in English and Indonesian. The population in the study is pregnant women. The study results are an effective information system used to detect maternal psychological health during pregnancy.

Quality assessment on articles using the Critical Appraisal Skills Program (CASP) for A Systematic Review of 4 selected articles. CASP is an evaluation instrument used to measure the quality and usefulness of the study (17). There are ten questions in the CASP instrument. The ten questions in CASP contain "yes," "no," and "not now" answer choices for each question. For each article, the score allocation is ten, judging from the number of "yes" obtained in reviewing the article. Articles with a "yes" score of more than seven are considered excellent articles. Scores obtained from one reviewer will then be combined into a single file. This CASP assessment does not aim to distinguish the quality of articles from one another. Still, it seeks to systematically determine the quality of articles based on a standard process of topics relevant to this research. From the results of the assessment, four articles were produced. The four articles have shown their eligibility for a systematic review because they have met the quality assessment criteria.

RESULTS

All English articles were searched using Google Scholar, PubMed, and Science Direct databases. Articles identified through a search database yielded 1,145 articles. There were 25 duplicate articles excluded. So that the number of articles becomes 1,120 after the duplicate articles are removed. A total of 1,107 articles were excluded because they were irrelevant and published before 2011. Of the 13 articles, the articles were selected after assessing the feasibility of the full text of the article. Nine articles were excluded because they did not match the statement. There are four systematic reviews articles, two articles are study protocols, and three are not in pregnancy. Finally, four articles met the inclusion criteria for inclusion in this systematic. The stage of selecting relevant articles is shown in Chart 1.

Pregnancy is a process that provides both physical and psychological changes for the mother. (19) Pregnancy is a significant event in a woman's life, affecting the psychological and the biological, familial, and social domains. (20) Pregnant women must adapt to these physiological and psychological changes. (2) Pregnant women are said to have disturbed psychological health when they cannot adapt (adaptation method) and cannot cope (coping method). If the mother can't adapt, then she can experience psychological disorders. (21)Mothers with psychological disorders during pregnancy are three times more likely to experience postnatal depression and have a negative psychological effect on their children. Psychological disorders such as anxiety can increase the hormone cortisol in utero, associated with impaired cognitive development and long-term behavioral and emotional problems. (22) Psychological health problems in pregnancy can also affect delivery outcomes(23) and are associated with increased fetal heart rate, low birth weight, fetal distress, congenital malformations, preterm labor, and low birth weight. (5)(24)

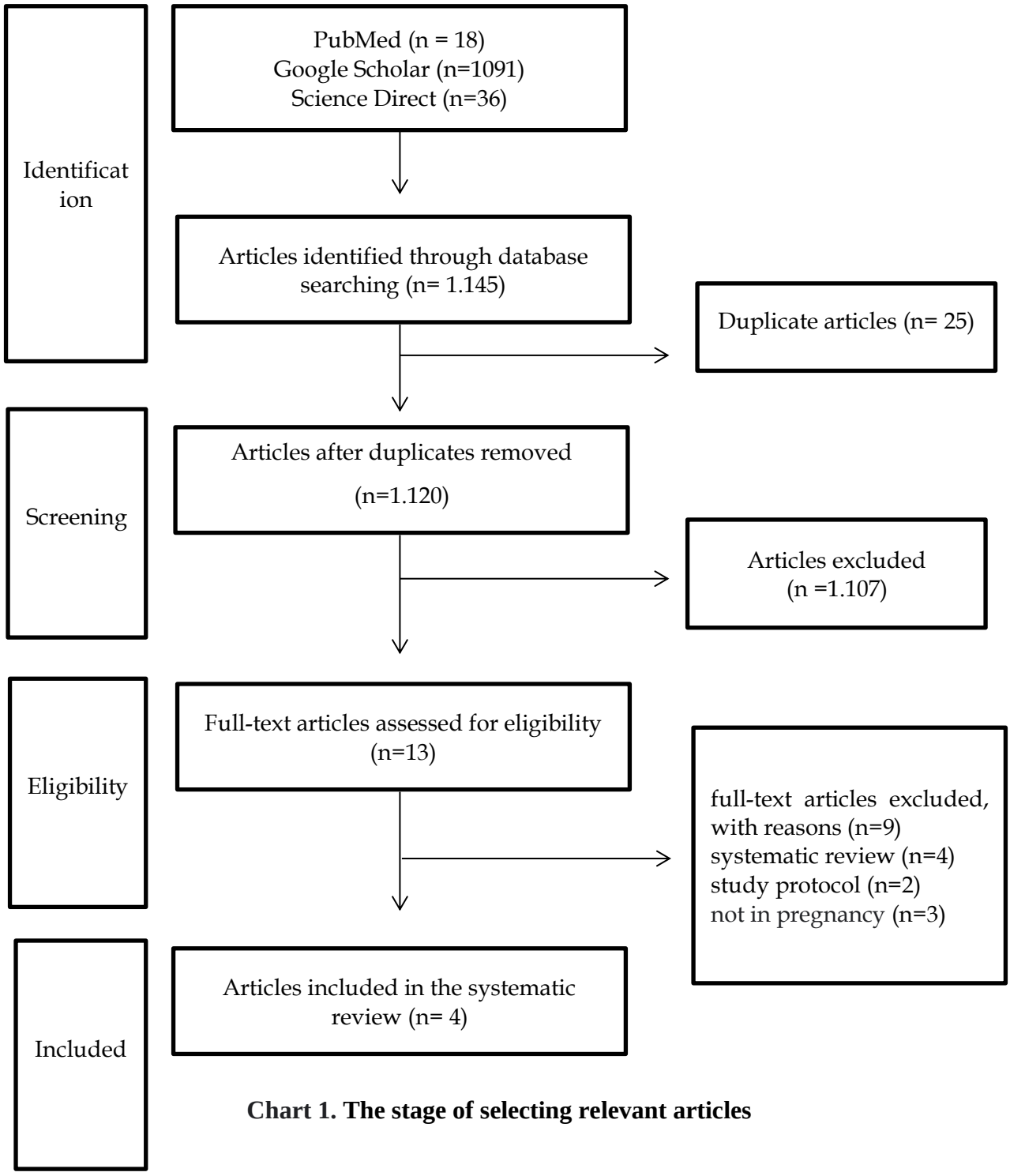

Chart 1. The stage of selecting relevant articles

Early detection is the best way to identify psychological disorders. Disease identification will be faster with routine and standardized early detection in community-based services in health facilities (25). However, mental health detection during pregnancy is under-detected and under-handled.(14) This happens because the psychological health assessment of pregnant women in obstetric clinics is usually carried out using verbal and paper-based questionnaires (11).

Several obstacles occur in detecting psychological health with manual systems (verbal and paper-based questionnaires), namely the lack of time, cost, geographical distance to health services, and transportation to get to health services (26). Previous research has explained that 80% of psychological health during pregnancy is undetected and untreated for reasons of stigma (14). With this stigma, most pregnant women also express discomfort in discussing mental health issues with both health workers and their families so that mothers can experience emotional difficulties and be late to seek help (7.24).

Another study explains that early detection with information systems is superior to paper-based early detection because e-screening is not more personal. Several respondents described the lack of privacy during manual screening as a barrier (7). The lack of integration in recording the psychological health of pregnant women and the absence of access to comprehensive data on prevalence and incidence are also obstacles in assessing the psychological health of pregnant women (27-28). Therefore, it is necessary to study and develop early detection methods as a practical first step, easy to implement by health workers and pregnant women, and to increase integration in the recording of psychological health of pregnant women by utilizing information systems.

With the information system, the obstacles in conducting early detection can be overcome. The use of M-Health has spread to make it possible to provide remote, low-cost, and easy-to-use services to provide services with a more significant number of patients. The information system includes processing health problems, including mental health problems, with efficient services (29). Several studies have utilized information systems to detect early psychological health problems of pregnant women discussed in this study. There are four studies on the role of information systems in the early detection of psychological disorders of pregnant women, which are discussed in depth.

The Dawn Kingston study has evaluated the feasibility and acceptability of web-based mental health screening/e-screening compared with paper-based screening in perinatal women. Screening using Antenatal Psychosocial Health Assessment (ALPHA) and Edinburgh Postnatal Depression Scale (EPDS) questionnaires. The research method used was Parallel-group, randomized controlled superiority trial. Respondents in this study were the class community of pregnant women in a hospital, divided into an intervention group and a control group randomly. The intervention group was given web-based electronic screening, and the control group was paper-based screening. The intervention group completed the Antenatal Psychosocial Health Assessment (ALPHA) and Edinburgh Postnatal Depression Scale (EPDS) questionnaires using a tablet computer, and the control group completed using paper. After completing the questionnaire, pregnant women will be called one week later to conduct an international neuropsychiatric mini-interview. Then perform a feasibility test and acceptance of electronic screening compared to paper-based screening. The results showed that mental health screening with web-based e-screening is feasible and acceptable, which means it is feasible and acceptable in providing mental health screening services (7).

Doherty's research explains that cellular technology has the potential for early detection of psychological health problems, the complex design of which is a challenge that must be overcome for public health examinations. This study explores the issues and barriers to using mobile phones in self-reporting maternal psychological health problems during pregnancy. This research appropriately frames M-Health technology as self-reporting, supporting self-awareness and disclosure, providing value to users through self-report features, and actively designing for engagement over time. The design of this research is a Qualitative Design Study with a sample of 38

respondents. This study highlights pregnant women's needs, motivations, and anxieties concerning technology use in pregnancy and the implications for cellular technology design. The results showed that proper tools used for self-reporting maternal psychological well-being during pregnancy have tremendous potential to improve understanding of well-being in pregnancy. Effective mental health screening programs, timely identification of signs and symptoms of anxiety. in pregnancy, treatment, and support is available for pregnant women who need it (11).

Laura M. La's research has evaluated the feasibility of sending SMS to pregnant women via smartphones. This prospective cohort study enrolled 203 pregnant and postpartum women receiving obstetric care at a Midwestern US academic medical center. The sample is 72% pregnant women with private insurance and 28% public insurance. Most of the survey respondents (92%) found it easy to accept the text, and 76% responded with excellent comments about the text. Smartphone mood screening and SMS support are technically feasible. The use of information system technology can overcome barriers to early detection and make it possible to improve mental health care for pregnant women (15).

Veronica's research compares usability and user satisfaction of a web and mobile app for a pregnant women's physiological health screening called Happy Mom. 348 and 175 pregnant women were recorded on the web and app versions of Happy Mom, respectively. Results showed that tall women in the web sample (27.3-511%) responded to each assessment with the application sample (9.53.1%).

Online platforms (web-based and application-based) can be a reliable and acceptable method for providing mental health assessments during pregnancy. User goals are suitable for both devices, especially regarding ease of use, time spent on the platform, and distractions in daily life. HM-Web obtained better results overall on the page (i.e., number of registrations and most of each health), indicating that perinatal mental evaluation can be performed successfully via the web (18).

DISCUSSION

This study aims to determine the role of information systems in detecting the psychological health of pregnant women and their role in health services. Early detection of the psychological health of pregnant women with previous information systems has been carried out by research. Previous qualitative studies have been conducted. The screening was initially done on a paper and face-to-face basis.

However, this method allows mothers to intentionally limit their disclosure of mental health problems before and during screening. The results of previous studies found that pregnant women would be more honest in disclosing their psychological health problems when screening was carried out with an information system that was carried out personally. E-screening is a viable approach for screening the mental health of pregnant women. Psychological health screening is essential for pregnant women.

Whether screening with information systems or screening with paper-based manual methods, pregnant women can express concerns about their psychological health. However, screening with information systems is superior to paper-based screening because of its more personal nature. The results showed that pregnant women prefer screening with information systems. Pregnant women who may not have experience using e-screening tend to feel confused or ambivalent. Still, research shows that pregnant women who have experience completing screening with information systems tend to prefer it. The information system screening group prefers the e-screening feature. This indicates that pregnant women feel that e-screening is a superior approach to screening to paper-based screening. Significantly more women in the e-screening group felt that screening was less time-consuming and more rewarding because it was more personal. The information system feature is a screening that makes it easier for mothers to answer questions about mental health problems than face-to-face or written approaches (7).

A cellular application for early detection of the psychological health of pregnant women has also been created as a form of utilizing the development of information systems in the

world of health. This research explains that BrightSelf and mobile apps (Android and iOS) are designed to be implemented in public health services, support self-reports on well-being in pregnancy, and provide some additional features, including interactive visualizations from the user. Concise data, health and permission information, and an idea engine share animated tips for healthy living. Reports were collected using visual analog scales for mood, sleep, worry, pleasure, and energy and contextual questions about location and semantic activity according to the EPDS consisting of 10 questions. Users are reminded to provide reports from time to time using notifications. The proper design of an attractive tool for self-report on psychological well-being can better understand well-being in pregnancy.

Effective mental health screening programs, and timely identification of depression and depressive symptoms, make treatment and support available to pregnant women who need it. mHealth technology precisely shapes the self-report experience, supports self-awareness and disclosure, provides value to users through self-reports and additional features, and actively designs interactions over time (11).

Previous research has shown that the new technology could increase the uptake of additional screening and treatment. Unlike paper screening, electronic screening offers immediate notification of positive results and the use of computerized adaptive tests that address the spectrum of psychiatric symptoms. This study uses adaptive testing, such as the Computerized Adaptive Test-Mental Health (CAT-MH™). The results of this study suggest that CAT-MH™ is an innovative tool that promises to improve the detection of perinatal depression, anxiety, mania, and suicide. Respondents who agreed to participate in this study received text messages sent within 72 hours of registering on www.cat-mh.com.

Then respondents can complete the CAT-MH™ on their smartphone. The link takes the subjects directly to the survey individually. No app download is required, and no user ID or password entry is required. The CAT-MH™ accommodates multiple language levels with questions at the sixth-grade reading level and reading the questions aloud to test takers. CAT-MH™ will automatically detect the psychological health of the respondent. The study results also explain that the detection of psychological health through personal smartphones is feasible and acceptable for pregnant women and postpartum mothers. A feasibility study has been carried out over 15 years of pen-and-paper screening experience. there are some drawbacks, especially the need for administration and the inability to screen mothers outside of obstetric visits (15).

More and more eHealth programs, especially those based on web applications and smartphone applications, have emerged as an alternative to manual systems such as paper-based and face-to-face due to the utilization of health information systems.

A study was conducted to compare the feasibility, acceptability, and user satisfaction of two devices (web vs. mobile app) of a perinatal mental health screening program. The results showed that the evaluation on HM-App and response rates during pregnancy and postpartum were consistently higher than those on HM-Web. This may be due to differences in sample recruitment methods. Recruitment at HM-Web is carried out in collaboration with health care professionals who provide access to the maternal code web code offered by health workers, especially midwives. On a contract basis, the HM-App is available for free download, without the collaboration of health care professionals for its deployment. In this case, mothers may be more motivated to use HM at least once when they feel that health care professionals are involved in the program. Another possible explanation for this finding is anonymity. The stigma of mental illness is a problem that often occurs during pregnancy that is considered confidential or private.

In HM-Web, you don't need to download any app visible on your phone. Just access the website (which can be done from any device) and complete the evaluation. Regarding satisfaction, both devices were considered easy to use and very well received, including no technical difficulties, direct inquiries, adequate response time, minimal impact on individual routines, and reliance on feedback received about emotional well-being (18).

Despite general satisfaction with HM, detection with information systems had a

perceptible impact on participants' mental well-being and future intentions to use the platform and recommend it to others. At the same time, these findings are significant and suggest the need to improve screening programs for perinatal women utilizing the technology. The platform for perinatal care is becoming an accessible and acceptable tool for psychological well-being assessment, health promotion, and treatment in routine care (16).

Based on the discussion, it is known that information systems can help solve problems, allow for rapid and adequate detection, and can overcome obstacles in the early detection of the psychological health of pregnant women. (29)The information system also makes it easier for pregnant women to obtain information on psychological disorders without meeting directly with midwives, doctors, and other health workers. Information systems play an essential role in increasing patient knowledge, self-management of disease, and remote monitoring of patients (30-31). Information systems during pregnancy have significant potential to carry out early remote detection. It also expands the reach of care in underserved populations, allows timely assessment and intervention, collects valid data, and overcomes stigma problems. It also supports honest disclosure, fosters trust between pregnant women and midwives, communicates more efficiently, and reduces the rate of diagnosis errors (11,13).

Information systems can perform data processing is done automatically. With computerized data processing, data and information processing management becomes more efficient. The resulting output becomes faster (32). With the development of information systems, clinical decision-making time by health workers can be done quickly. The longer the detection process affects the handling and subsequent actions (29,33). The use of information systems in the early detection of the psychological health of pregnant women not only increases the speed of service but can also increase the number of health services (34,35)

CONCLUSION

Based on the results of a systematic literature review, it can be concluded that referring to the success of psychological health screening of pregnant women published in published journals that an information system is an effective tool in early detection of the psychological health of pregnant women. The role of information systems is beneficial in carrying out early detection of the psychological health of pregnant women so that obstacles in the early detection process can be overcome by utilizing information technology. Based on the first journal review, it was stated that early detection on paper-based and face-to-face but this ham creates dishonesty. With the information system, early detection is more personal, so it is more preferred by pregnant women. The results of the second journal review stated thatBrightSelf and mobile apps (Android and iOS) are designed to be implemented in public health services. It also supports self-reports on well-being in pregnancy. It provides additional features, including interactive user data visualization, concise health and support information, and an idea engine, which shares tips. Animated health tips. The results of the third journal review stated thatCAT-MH™ is an innovative tool that promises to improve the detection of perinatal depression, anxiety, mania, and suicide. Journal review results in fourth have created two devices (web and mobile applications) as a mental health screening program. The results show that HM-Web is superior to HM-App. But regardless, detection with information systems has a perceptible impact on participants' mental well-being and future intentions to use the platform and recommend it to others.

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Table 1. Main Characteristics of the Studies Included (n = 4)

	Title	Author	Methodology	Aim	Results
1	Pregnant Women's Views on the Feasibility and Acceptability of Web-Based Mental Health E-Screening Versus Paper-Based Screening: A Randomized Controlled Trial (7) *(J Med Internet Res 2017;19(4):e88)* doi: 10.2196/jmir.6866 (2017)	Dawn Kingston, RN, MSc, PhD; Marie-Paule Austin, FRANZCP, MD; Sander Veldhuyzen van Zanten, MSc, MPH, MD, Ph.D.; Paula Harvalik, RN; Rebecca Giallo, Ph.D.; Sarah D McDonald, MSc, FRCSC, MD; Glenda MacQueen, PhD; Lydia Vermeyden, MSc; Gerri Lasiuk, RN, RPN, PhD; Wendy Sword, RN, PhD; Anne Biringer, CCFP, FCFP, MD	Experiment randomized controlled trial Sample: 636 pregnant women were randomized to the intervention (n=305) or control (n=331) groups	Evaluating the feasibility and acceptance of web-based e-screening to detect mental health compared to a paper-based screening of pregnant women. And knowing the factors associated with women's preference for electronic early detection and disclosure of mental health problems.	The results showed that e-screening was acceptable and appropriate to provide mental health services for pregnant women as primary health care. Pregnant women in the e-screening group revealed that e-screening was consistently more profitable than the control group or the paper-based screening group because e-screening was more private, confidential, and time-saving.
2	A Mobile App for the Self-Report of Psychological Well-Being During Pregnancy (BrightSelf): Qualitative Design Study (11) *(JMIR Ment Health 2018;5(4):e10007)* doi: 10.2196/10007 (2018)	Kevin Doherty, BA, BAI, MAI, MSc; Marguerite Barry, BCL, HDip, Ph.D.; José Marcano-Belisario, BSC, MBBS, MPH; Bérenger Arnaud1, BASc, MSc, PhD; Cecily Morrison, BA, PhD; Josip Car, MSc, MD, PhD DIC; Gavin Doherty1, BA (Mod), DPhil	This paper presents design research conducted as part of the development of BrightSelf, a mobile application for self-report psychological well-being during pregnancy.	This study explores the problems and barriers to using mobile phones related to self-reporting of maternal psychological health problems during pregnancy.	During pregnancy, it is necessary to assess and treat psychological well-being. Health technology can support pregnant women's self-awareness about the importance of self-reporting related to psychological health problems during pregnancy. This research develops mHealth technology that can appropriately support self-awareness, disclosure, and assessment of the psychological well-being of pregnant women effectively and can be used from time to time.
3	Feasibility of perinatal mood screening and text messaging on patients' smartphones. (15)	Laura M. La Porte1 & J. Jo Kim1,2 & Marci G. Adams1 & Benjamin M. Zagorsky3 & Robert Gibbons4	A prospective cohort study with a sample size of 203 pregnant and postpartum women at a	Evaluating the feasibility of screening and texting in pregnant women using a personal smartphone.	Most survey respondents (92%) found it easy to receive texts, and 76% responded with excellent comments about texts.

	Archives of Women's Mental Health https://doi.org/10.1007/s00737-019-00981-5 (2019)	& Richard K. Silver	Midwestern US academic health center.		Smartphone mood screening and SMS support is technically feasible. Screening completion is lower among single women with public insurance.
4	Usability, Acceptability, and Feasibility of Two Technology-Based Devices for Mental Health Screening in Perinatal Care: A Comparison of Web Versus App.(18) Published by Springer Nature Switzerland AG 2019. https://doi.org/10.1007/978-3-030-25872-6_14 (2019)	Veronica Martínez-Borba(&), Carlos Suso-Ribera, and Jorge Osma	Longitudinal assessments. Sample: Consisting of 523 perinatal women enrolled in HM. This, 348 women were enrolled in the web version (HM-Web) and 175 participants used application version (HM-App).	Comparing the feasibility, usability, and user satisfaction of the two devices (web vs mobile app) from an online program for perinatal depression screening called HappyMom.	Results showed that a higher percentage of women in the web sample (27.3–51.1%) responded to each assessment than the app sample (9.1–53.1%).In summary, online platforms (web-based and application-based) can be a reliable and acceptable method for providing mental health assessments during the perinatal period. User satisfaction is suitable for both devices, especially regarding ease of use, time spent on the platform, and distractions in daily life.