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SAFETY OF PREGNANT WOMEN DURING THE COVID-19 PANDEMIC BY USING THE TELEHEALTH APPLICATION: A *SYSTEMATIC REVIEW*

Iva Satya Ratnasari [1], Indah Rahmaningtyas[2], Finta Isti Kundarti[3]

[1,2,3] Kediri Midwifery Study Program, Malang Ministry of Health Police, Kediri
Correspondence address:
Jl. KH. Wakhid Hasyim No. 64B, Bandar Lor, Mojoroto, Kediri, East Java, Indonesia
Email : fintaistikundarti@gmail.com

Abstract

Introduction: The COVID-19 pandemic has affected the routine access of pregnant women to do ANC visits at health facilities. Various midwifery services have changed and developed through telehealth. **Objectives:** Analyze the effect of telehealth applications on pregnant women's safety during the COVID-19 pandemic through a systematic review. **Methods:** This study used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The literature was carried out using keywords and Boolean operators through Pubmed, ProQuest, Science Direct, and Wiley Library databases with the publication year from December 2019 to January 2022. **Results:** 5 articles met the inclusion criteria. Two studies were conducted in the United States. Studies were also conducted in Australia, Poland, and China. The use of telehealth was safe to apply to pregnant women to carry out pregnancy care during the COVID-19 pandemic because telehealth services increase patient access to health care providers. A total of 3 articles described that the use of telehealth compared to general face-to-face care did not lead to worse pregnancy outcomes and could reduce the spread of the COVID-19 virus among pregnant women. **Conclusion:** The use of telehealth was safe for pregnant women to carry out pregnancy care during the COVID-19 pandemic and beyond. Although the use of telehealth had limitations such as difficulties in conducting a comprehensive physical examination and the possibility of obstacles in the use of technology, telehealth could continue to be developed in addition to and complement in-person visits. Further research could be done by minimizing bias in retrospective studies.

Keyword : COVID-19, Patient safety, Pregnancy, Telehealth

INTRODUCTION

The COVID-19 pandemic is an acute respiratory syndrome caused by the SARS-CoV-2 virus. COVID-19 cases as of November 29, 2021 there were 260,867,011 cases and 5,200,267 deaths globally (WHO, 2021). This virus can be transmitted directly or indirectly (Lotfi, Hamblin and Rezaei, 2020).

The group that is vulnerable to COVID-19 is the elderly and has a history of disease. Pregnant women are also a vulnerable group and have a greater risk of complications due to COVID-19 virus infection. This is because there are physiological changes in the

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immune and *cardiopulmonary systems* during pregnancy (Wang *et al.* , 2021) . Therefore, the treatmentof pregnancy to ensure the condition of the mother and the baby she contains is important to do (WHO, 2016).

The anc visit was conducted face to *face* (Abraham, 2020). WHO recommendations at least 8 contacts (WHO, 2016). The standard of ANC visits in Indonesia is at least 4 times and the national target is 95%. In fact, in 2020 the K4 achievement reached 84.6% and there was a decrease in 2019, which was 88.54% (Ministry of Health, 2021). Not only in Indonesia, some countries affected by COVID-19 also experienced a decrease in the frequency of ANC visits, in america with an ANC visit schedule of 12-14 kali for low-risk pregnancies and decreased (Shields *et al.* , 2020) .

The COVID-19 virus pandemic has also affected the routine access of pregnant women to ANC visits in recent years. The implementation of the social distancing strategy "*social distancing*" led to a decrease in maternal visits in health facilities (Montagnoli *et al.* , 2021) . Various midwifery services have undergone changes and developed using *telehealth*. The benefits of using *telehealth* are improving *perinatal* outcomes, patient satisfaction, and lowering health care costs (Nelson and Holschuh, 2021). Virtual maintenance models are also safe (Jakubowski *et al*., 2021).

Patient safety or safety is an effort to prevent and reduce the risk, errors and losses to patients during the provision of health services. (WHO, 2019). Based on the background above, researchers want to know the application of the use of *telehealth* to the safety of pregnant women during the COVID-19 pandemic by using *systematic review*.

METHOD

Selection Strategy

The method used in this study is *Systematic Review* which aims to analyze the influence of *telehealth* use on the safety of pregnant women during the COVID-19 pandemic. The data was identified from December 2019 to January 2022. Literature searches were conducted through *the Pubmed, ProQuest, Science Direct,* and *Wiley Library* databases using the keywords "*Telehealth*" AND "*Pregnancy*" AND "*Pandemic*"; "*Telehealth*" AND "*Pregnancy*" AND "*Pandemic*" AND "*Patient Safety*."

Study Selection

The selection of studies is carried out by selecting relevant and abstract titles that are reviewed directly by reviewers. Then the screening was carried out based on inclusion criteria, namely: *original research* journals in 2019-2022, with high-risk and low-risk pregnant women, discussing the use of *telemedicine* and *telehealth* for pregnancy care, journals in English, *full articles*, and have a DOI and / or ISSN index. The study design criteria included in this article are *cross sectional*, *prospective and retrospective study,* and *cohort study.*

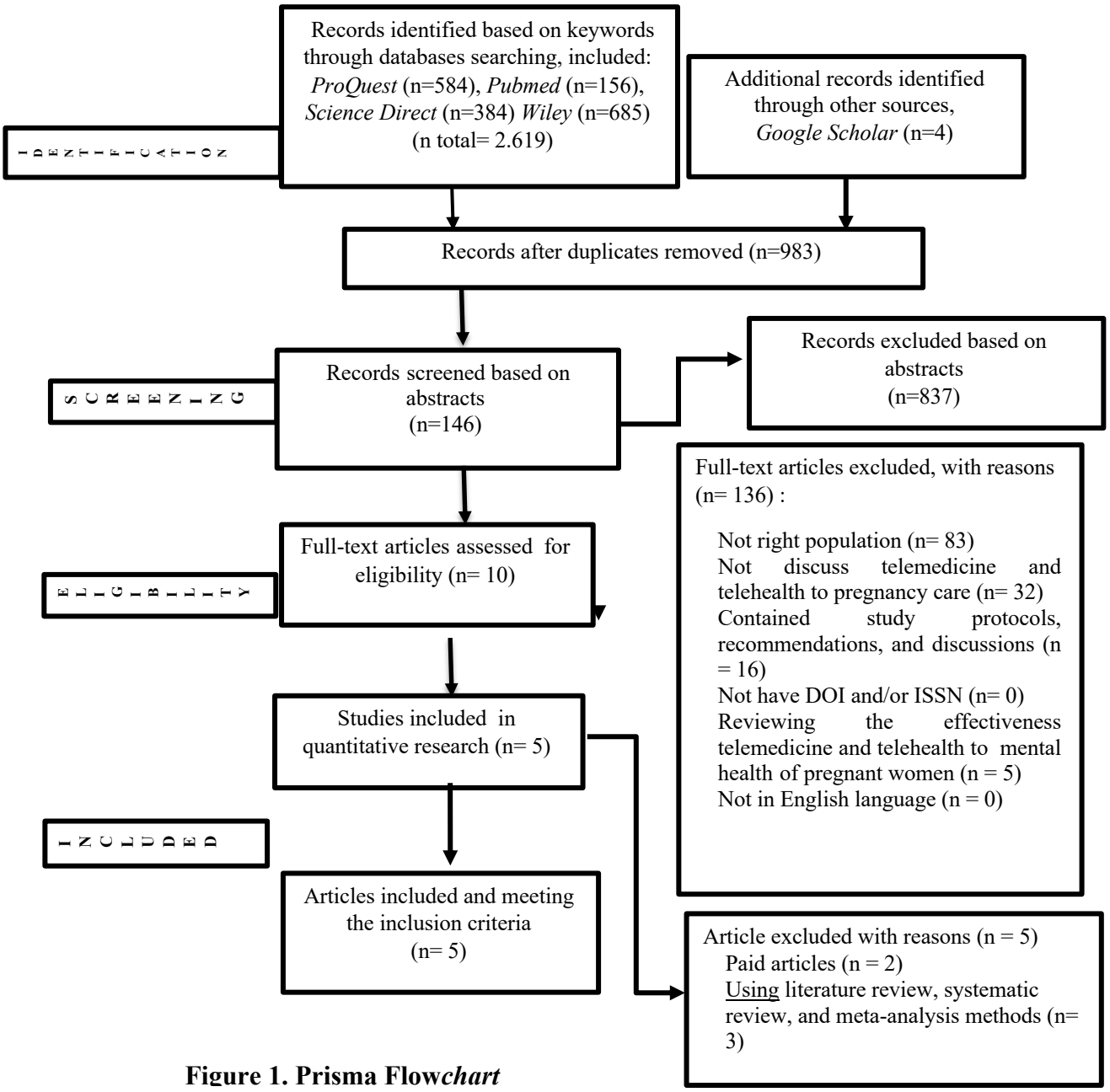

Figure 1. Prisma Flow*chart*

The prisma flowchart described how the process of researchers in finding and selecting articles to be included in this study **(Figure 1)**. The process in the prism flowchart table included journal identification, screening, assessed the eligibility of the articles, and selected the articles included in this study. In the identification process, researchers identify the articles by setting keywords that include *"Telehealth"* AND *"Pregnancy"* AND *"Pandemic"* also *"Telehealth"* AND *"Pregnancy"* AND *"Pandemic"* AND *"Patient Safety."* These keywords were input into the database searching included *Pubmed, ProQuest, Science Direct*, and *Wiley Online Library*. Records identified based on keywords through databases searching, included *ProQuest* were 584 articles, *Pubmed* were 156 articles, *Science Direct* were 384 articles, and *Wiley Online Library* were 685 articles. Total of 2,619 articles from the database identified. Then the researcher also identified additional records from other sources to checked the duplication, from *Google Scholar*. Additional records identified through other sources were 4 articles. A number of 2,623 identified articles were input into the Mendeley application to check for duplication of journals from multiple sources. A total of 1,640 articles were removed and remaining 983 articles after duplicates removed. A total of 983 articles were screened based on abstracts. The records excluded based on abstracts were 837 articles. A total of 146 articles were assessed based on full-text articles to determine the eligible articles. A total of 136 articles excluded, with reasons Not right population were 83 articles, Not discussed telemedicine and telehealth to pregnancy care were 32 articles, Contained study protocols, recommendations, and discussions were 16 articles, Not have DOI and/or ISSN were 0 articles, Reviewing the effectiveness of telemedicine and telehealth to mental health of pregnant women were 5 articles, Not in English language were 0 articles. From the total of 10 Full-text articles remaining, 5 articles excluded with reasons there are 2 Paid articles, 3 articles Using literature review, systematic review, and meta-analysis methods. Total studies included in quantitative research were 5 articles and finally a total of 5 articles were included in this study.

RESULTS AND DISCUSSIONS

RESULT

After the articles obtained, the researcher entered data from each article in the research results table, which included the title, *author*, country, year of publication, research design, instruments that used, population and sample, place and time of research, *database*, type of platform used, as well as research results. Researchers then summarize articles that fit the criteria that have been set by using analytical techniques, namely looking for similarities *(Compare)*, looking at inequalities *(Contrast)*, and then give a view *(Criticize)* of the results of the articles obtained. Researchers found 5 international articles tailored to the purpose of the study and qualified for inclusion and exclusion criteria. The majority of articles are published in 2021. The research design used by the majority used *cohort studies.* Based on the article found, 2 studies conducted in United States. The studies also conducted in Australia, Poland and China with a total of 37,068 respondents.

Table 1. *Systematic Review* Results Presentation

No	*Author* (year) Country	Design	Instruments	Population (N) or Sample (n)	Place Research Time	Platform Type
1.	Alex F. Peahl *et al* (2021) United States	Retrospective Analysis	Qualtrics (Provo,UT) software for developing surveys. The survey was adapted from the *Telehealth Usability Questionnaire.*	N : 1690 pregnant women n : 253 pregnant women Response rate: 15.0% $\bar{x}$ the age of pregnant women is 31.2 ± 6.7 years. The majority of pregnant women are multiparous, college graduates, and working.	Michigan University, Midwest, U.S. The research time is December 16, 2019 to June 28, 2020.	Audiovisual virtual visits, unspecified platforms
2.	Dominik Jakubowski *et al* (2021) Polish	Cross sectional	The anonymous questionnaire contained 98 questions in Polish and was collected through the *Research Electronic Data Capture* (REDCap) platform.	N : 618 pregnant women n : 618 pregnant women The majority of access to private health care (n: 477) and public health (n: 141).	Pomeranian Medical University, Al. Powsta´nców Wlkp. Szczecin, Poland, data was collected from August 5, 2020 to October 29, 2020.	Video and phone consultations
3.	Kirsten R Palmer *et al* (2021) Australia	Cohorts	Data taken from the Maternity Outcomes System (*Melbourne Clinical and Translational Sciences*, Melbourne, VIC, Australia)	N : 23,008 pregnant women n : 23,008 pregnant women $\bar{x}$ the mother's gestational age is 31.29 ± 5.19 weeks.	Monash Health, Melbourne, Victoria, Australia. Research time between January 1, 2018, and July 26, 2020.	Video and phone consultations
4.	Elaine L. Duryea *et al* (2021) United States	Cohorts	The data was taken from the hospital information system and implemented based on the Guidance for Strengthening The Reporting of Observation Studies in Epidemiology (STROBE).	N : 12,607 pregnant women n : 12,607 pregnant women (6559 direct prenatal visits and 6048 audio-only virtual visits). $\bar{x}$ pregnant women's gestational age that is 27.7 ± 6.5 weeks.	Parkland Health System and Hospital, Dallas, Texas, United States. The research time is May 1, 2019 to October 31, 2020.	Virtual audio visits via phone
5.	Xiao-Xia Gu *et al* (2020) China	Cohorts	All data is obtained from the Hospital Information System	N : 582 pregnant women n : 582 pregnant women The majority of pregnant women are aged between 20-34 years and nuliparous.	Zhongda Hospital, Southeast University, Nanjing, Jiangsu Province, China. The research time is from January 2019 to February 2020.	Audiovisual visits through hospital web applications and 5G networks that can be accessed via *mobile phones*.

DISCUSSION

A study conducted on pregnant women and/or childbirth in Poland during the COVID-19 pandemic stated that there is no relationship between health services (private/public or face-to-face/*hybrid*) with the implementation of prenatal care standards. However, there was a significant association between pregnant women in hybrid and face-to-face groups with components having difficulty accessing medical care due to the pandemic (Jakubowski *et al.* , 2021) . Difficulty accessing medical care during the pandemic due to restrictions or lockdowns implemented by the government and also due to concerns about pregnant women to access medical care directly for fear of COVID-19 virus infection (Riley *et al*, 2020) . This is associated with a decrease inpatient visits in the health service.

Given the importance of maternity care for pregnant women, during the COVID-19 pandemic, *the Royal College of Obstetricians and Gynecologists* (RCOG) recommends a minimum of six ANC contacts (a reduction of eight contacts) forlow-risk pregnancies. Adoption technology can be maximized to minimize unnecessary contact between the patient and the service provider (Quinn *et al.* , 2021) . An American study reported a significant increase in stillbirths during the COVID-19 pandemic with a reduction in pregnant women seeking maternity care (Khalil *et al.* , 2020) . Pregnant women who have symptoms of COVID-19 may experience more severe outcomes than non-pregnant people (Kotlar *et al.* , 2021) . The risk of pregnancy complications that can occur such as premature birth, *gestational* hypertension, *gestational* diabetes, and miscarriage (Tozour *et al*., 2021; Durankuş & Aksu, 2020; Murphy, 2020) . Other studies have also reported a significant increase in patient visits after conversion to *telehealth* care from 53 visits per day to 40 visits per day (Shields *et. al*., 2020). This is also supported by other research that revealed that after the adoption of the *telehealth* treatment model during the COVID-19 pandemic, the average frequency of weekly pregnancy care visits decreased from 898 to 765. visit. There will be an increase in the proportion of virtual visits from 10.8% to 43.3%. (Peahl *et al.* , 2021) . The proportion of virtual visit increases is also shown by a study conducted in Australia which reported that there was a rapid increase in *telehealth* consultation visits during the implementation period from 0.06% to 53% (Palmer *et al.* , 2021) . This increased proportion of visits

suggests that most pregnant women believe that virtual visits improve access to health care and are safe to implement.

Telehealth is a healthcare service that utilizes technology to convey health information to patients in remote or mobile settings (Greiner, 2017). *Telehealth* bridges the gap between humans, doctors and health systems and emerges as aneffective and sustainable solution for disease prevention, prevention and treatment (Sharmila, Babu and Balakrishnan, 2020). *Telehealth* contains a broader spectrum and involves remote "nonclinical" services, such as healthcare provider training, administrative meetings, medical education for providers and patients conducted outside of clinical services (Lee and Hitt, 2020). Telehealth services can be virtual visits, remote monitoring, and *mHealth* treatment (Denicola, 2020). *Telehealth* services for pregnancy care can be remote consultation services, *ultrasound* recording monitoring including fetal heart rate monitoring, genetic counseling, diabetes education, and chronic medical disease management such as chronic diabetes, hypertension, and others (Shields *et al.* , 2020) .

This type of *telehealth* application can be done with video, audio, and text-based media (Indian Medical Council, 2020). *Audiovisual-based telehealth* visits may be more suitable for pregnancy care because pregnant women certainly want virtual visits that are carried out comparable to conventional visits where patients can see the faces of practitioners, doctors, midwives or health workers connected to them. Electronic communication that can replace the face-to-face way of traditional treatment is to use telecommunication devices that at least include audio and video devices (CMS, 2020). The use of *the Zoom*^{TM} platform is an identified audiovisual-based media used for consultation with doctors (Lapadula *et al*., 2021; Shields *et al*., 2020). In line with research conducted in Nigeria which also uses *the Zoom* app for pregnancy care consultations and illustrates the benefits of using *the Zoom* platform including increased access to direct information, convenience, convenience, compliance with COVID-19 pandemic prevention and control protocols, reduced hospital waiting times and reduced costs and frequency of hospital visits (Ade-ojo *et al.*, 2021) . A study also revealed that one of the advantages of *audiovisual* services is that it can allow clients to have face-to-face access with service providers. The provider can show the client how to do something rather than just explaining how to do it. It is more effective to give advice via *audiovisual* than to use the phone, but not as effective as face-to-face (Clay-Williams *et al.* , 2017) .

The use of technology to provide healthcare is not without its obstacles and limitations. Barriers to *telehealth* use can also interfere with continuity of care because patients may not be able to see the same health care provider at all times. Remote diagnosis is sometimes difficult because some tests need additional equipment, the possibility of technical difficulties and inadequate internet access (Gajarawala and Pelkowski, 2021) and wrong diagnosis can be happened (misdiagnosis) due to distance or lack of information so that it risks causing annoyance, malpractice and legal issues (Nelson and Holschuh, 2021). The use of *telehealth* in pregnant women must be ensured safe and not done through media that can be accessed by the general public because it is related to the privacy of pregnant women themselves and does not harm the pregnancy of pregnant women who use these media.

Reviewing pregnancy outcomes in pregnant women who perform health care with *telehealth* to ensure that *telehealth* use does not lead to worse pregnancy outcomes than conventional care, research conducted in Australia shows that pregnancy results after the application of *telehealth.* Antenatal treatment appears to be similar to conventional face-to-face care. The proportion of premature birth babies is similar for all time periods (conventional periods and *telehealth* periods) in both treatment models (high-risk and low-risk maternity care), where in pregnant women the low risk of the proportion of premature birth babies is 4% of 1768 babies in *the telehealth* period and 6% of the 15,516 babies in the conventional period. The proportion of babies born prematurely in the high-risk maternity care model was 29% of the 574 babies in the *telehealth* period and 27% of the 4897 infants in the conventional period. The number of preterm births in high-risk pregnant women decreased by 0.68% per week after *telehealth* integration compared to conventional treatment periods. In addition, there was no significant difference in the overall incidence of stillbirth between the period of *telehealth* and conventional treatment. A 0.22% reduction in the number of stillbirths per week was also obtained after the integration of *telehealth* in the care of high-risk pregnant women (Palmer *et al.* , 2021) . The results of this study are in contrast to the results of a recent study conducted in the United States which reported that there was an increased incidence of neonate or infant deaths in the pandemic group, compared to the pre-COVID-19 group, increasing from 3.23% to 5.42% (Reneker *et al.* , 2022) . Other studies in the United States have also explored the relationship of audio-based virtual prenatal care with perinatal outcomes.

The results of this study stated that women who gave birth in 2020 did not experience worse pregnancy outcomes than women who gave birth in 2019. The proportion of stillbirths in conventional care is 0.006% and on *telehealth* care is 0.005%. Women with a greater number of virtual visits tend to experience placental solution, preterm delivery, or require transfusions during childbirth (Duryea *et al.* , 2021) . However, a study conducted in China showed that preterm births did not differ significantly in both cohorts, the number of preterm births in 2019 was 18.65% and by 13.28% in 2020. In general, pregnancy outcomes, including maternal and neonatal outcomes, performed during the 2020 epidemic are the same as 2019 pregnancy outcomes. The study also reported that no hospital-acquired COVID-19 infections were found in pregnant women after *telehealth* was applied (Gu *et al.* , 2020) . This means that with a decrease in direct visits at health care facilities, the implementation of *telehealth* does not lead to worse pregnancy outcomes and increases patient access to service providers.

CONCLUSION, SUGGESTION, AND ACKNOWLEDGMENT

The use of *telehealth* is safe to apply to pregnant women to carry out pregnancy care during the COVID-19 pandemic because *telehealth* services increase patient access to service providers, reduce the spread of the COVID-19 virus among pregnant women, and did not lead to pregnancy outcomes that were worse than face-to-face care in general. The use of *telehealth* can be developed in addition and complement in-person visits to provide future pregnancy care. Even so the use of *telehealth* also has limitations such as difficulty in conducting a comprehensive physical examination (including if you need a supporting examination such as a laboratory), radiological examinations, as well as certain procedural measures), the possibility of technical difficulties and inadequate internet access, economic conditions, security violations. Regulatory barriers can also limit the formation of emotional connections between providers and patients. Further research can be done by minimizing bias in retrospective research.

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