The Impact of COVID-19 on Assisted Reproductive Technology (ART) in Indonesia: A Systematic Literature Review

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Abstract. The COVID-19 pandemic in Indonesia put pressure on assisted reproductive technology (ART) practices. Travel restrictions and hospital closures reduced access to ART which are located mostly in capital cities. Thus, investigating how the pandemic affected Indonesian ART services is crucial. This study reviewed literature using PRISMA method. PICO Model criteria were used to search articles. During the COVID-19 Pandemic. Papers were obtained from Google Scholar, ResearchGate, and Cerdika databases. Researchers searched journals spanned between 2022 – 2024 for "COVID-19" and limited the publication year to 2020 – 2021, the year of pandemic. The results of the study show that the COVID-19 pandemic had a significant effect on Indonesia's use of ART. It was more challenging to reach and use ART therapies with travel restrictions and health facility closures. Nonetheless, most fertility clinics had changed their health standards in response to the circumstances. The recommendations point to more investigation to better understand how the pandemic had affected ART services and to create fresh approaches to deal with the evolving pandemic scenario. We suggest that more hospitals and primary health care institutions have a better standard for ART in a significant force situation. Also, multiply the services in more locations; thus, if travel restrictions happen in some circumstances, the patient still gets to the services closest to their house.

1 Introduction

Infertility is a functional disorder that prevents natural conception. Infertility is the inability to conceive following 12 months of consecutive sexual intercourse under normal conditions or a decrease in the ability to reproduce. Various treatment methods, including Assisted Reproductive Technology (ART), are often used to address infertility [1].

Assisted Reproductive Technology is a medical service that helps address reproductive disorders that may prevent pregnancy. One of these technologies is In Vitro Fertilization

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(IVF), in which parts of the pregnancy occur outside the body. This involves the removal and maturation of oocytes, fertilization with spermatozoa through a method called Intracytoplasmic Sperm Injection (ICSI), and the development of embryos outside the body. The embryos returned to the uterus after some time to achieve pregnancy. However, the pregnancy success rate with this technology is still not optimal, ranging from 40% to 60% [2].

The global COVID-19 pandemic had a significant impact on several facets of life, including the domain of reproductive technology and the utilization of ART. Since its first identification as a cluster of pneumonia cases in Wuhan, China, in December 2019, COVID-19 rapidly spread globally, leading to the declaration of a global health emergency by the World Health Organization (WHO) in January 2020 [3]. COVID-19 can result in severe respiratory problems, multi-organ dysfunction, and even death [4-5]. It was a major global challenge as it was challenging to control and predict its spread, and there were no known cures or vaccines [3].

The potential for the virus to spread by staff infected with SARS-CoV-2 during the pre-symptomatic period or when experiencing mild symptoms underscored the need for broader symptom screening recommendations for healthcare workers and the implementation of the ubiquitous use of face masks among all healthcare personnel in long-term care facilities [6]. Healthcare resources were significantly impacted and the delivery of non-essential and urgent care, including ART services, had to be postponed [7]. This was due to travel restrictions, healthcare facility closures, and increased concerns about virus transmission. Many reproductive clinics were forced to reduce the number of patients served, leading to long queues and treatment delays for couples undergoing ART.

Economic factors also contributed to the impact of COVID-19 on ART in Indonesia. Many couples experienced a decrease in income or job loss due to the pandemic, making it challenging for them to continue or start ART treatment, which required significant expense.

Hence, it is imperative to comprehend the implications of the COVID-19 epidemic on the availability, utilization, and accessibility of ART in Indonesia. Analyzing these impacts can provide valuable insights for reproductive healthcare providers and the government in developing policies and strategies to maintain accessibility and sustainability of assisted reproductive care in the future.

This study aims to explore the pitfalls between travel restrictions in a pandemic era, their effect on ART services, and other problems. We hope this study's results can give readers and stakeholders insight if some circumstances happen in the future. Thus, ART services can still be in the middle of force significant conditions, like the COVID-19 pandemic.

2 Methods

This study was undertaken as a systematic literature review on the utilization of ART during the COVID-19 epidemic in Indonesia. The aim was to investigate, evaluate, and interpret each article used to address this phenomenon. To search for literature, the researcher used a combination of Indonesian keywords, which included “Assisted

Reproductive Technology," "*Teknologi Reproduksi Berbantu*," and "Indonesia," along with the conjunction "AND". The researcher limited the publication year of journals to 2020-2021, as well as adding the keyword "COVID-19" to journals published in 2022-2024 to focus the search.

The articles included in this study discuss using ART during the COVID-19 pandemic in Indonesia, both within the qualitative and quantitative research framework. The research must be conducted in Indonesia, and must also be written in Bahasa Indonesia or English.

The article search was performed according to the qualifying criteria outlined in the PICO Model. Data sources for this research were obtained from several full-text sources published in various databases such as Google Scholar, ResearchGate, and Cerdika databases. To limit the scope of the study, the researcher utilized the PICO method (Population/Problem, Intervention, Comparison, Outcomes) and the PRIMA diagram flow.

The application of PICO used is as follows: P = ART; I = Implementation of ART in Indonesia during the COVID-19 pandemic; C = -; O = Implementation of ART in Indonesia during the COVID-19 pandemic.

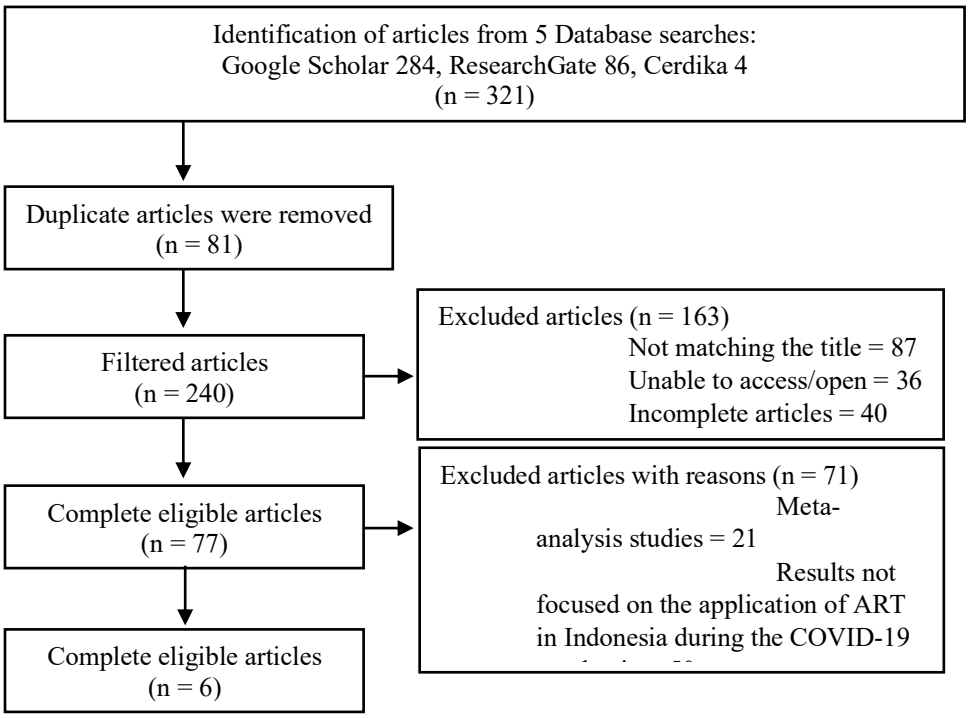

Fig. 1. PRISMA Method Diagram: Search and Article Selection Flowchart

According to the PRISMA process, 321 scientific articles were found to discuss the implementation of ART in Indonesia during the COVID-19 pandemic. Out of these, 81 articles were identified as duplicates from different sources, which resulted in 240 filtered articles. Further screening found that 163 articles did not match the intended title, were inaccessible, or incomplete, leaving 77 articles. Based on the research methods used and the focus of the reviewed research, six journals were selected for investigation in this research.

3 Results and discussion

The results of the literature review conducted on six articles are presented in Table 1.

Table 1. The results of literature review conducted

No	Author	Title	Objective	Research Method	Results
1.	Budihastuti, et al. (2023) [8]	Efforts To Increase Understanding Of COVID-19 Screening In Assisted Reproductive Technology Services	To analyze the importance of COVID-19 screening education in ART services using pre and post-test.	Quantitative	An improvement in comprehension of COVID-19 screening was observed in post-test education in ART services conducted through video calls, as compared to pre-test.
2.	Budihastuti, et al. (2023) [9]	Education On Assisted Reproductive Technology Program with Low Cost	To test the effectiveness of service programs in providing an understanding of ART with affordable costs to infertile couples.	Quantitative	Participants demonstrated a notable disparity in their pre-test and post-test scores, suggesting their comprehension of the explanations given by the service provider.
3.	Budihastuti, et al. (2023) [10]	*Edukasi Skrining COVID-19 pada Program Teknologi Reproduksi*	To understand the provision of education	Qualitative	The research results indicate that education on COVID-19 screening through

No	Author	Title	Objective	Research Method	Results
		Berbantu di Era Pandemi COVID-19	about COVID-19 screening for couples undergoing ART programs.		YouTube live-streaming programs successfully increased public understanding, especially among couples undergoing ART programs, and prepared them well for COVID-19 screening tests and services.
4.	Wiweko, et al. (2021) [11]	COVID-19 Pandemic Impacts Decision-Making and Psychosocial Behavior in Women Seeking Fertility Treatment in APAC—an ASPIRE Patient Experience Report	Developing patient-centred guidelines in fertility treatment.	Quantitative	Women residing in countries with effective infection control measures and living under the "new normal" conditions generally exhibit lower levels of concern regarding the repercussions of the pandemic on their lives and financial situations. Most patients plan to continue or start fertility treatment after fertility clinics can be re-accessed.
5.	Hinting, et al. (2020) [12]	A Review of the Impact of COVID-19 on Male Reproduction and its Implications on Assisted Reproductive Technology Services	Evaluating the potential of SARS-CoV-2 infection on male reproductive organs and its impact on semen	Quantitative	The study concludes that although male reproductive organs have a potential vulnerability to SARS-CoV-2 infection, there is no indication of a clear relationship

No	Author	Title	Objective	Research Method	Results
			quality and ART outcomes.		between viral infection and male reproductive organs.
6.	Wiweko, et al. (2020) [13]	SARS-CoV-2 and Assisted Reproductive Technology Practice: An Asia Pacific Initiative on Reproduction (ASPIRE) Position Paper	Understanding the knowledge and awareness of ART in improving patient care quality	Qualitative	This paper presents ASPIRE's viewpoint on improved management of infertile patients seeking ART. The recommendations presented are intended to support responsible authorities and healthcare providers in providing high-quality and safe ART.

3.1 COVID-19 pandemic phenomenon in Indonesia

The Asia-Pacific area was severely affected by the epidemic, with more than 7 million cases documented. India experienced the most severe impact, with cases surpassing 3 million, followed by Bangladesh, Pakistan, the Philippines, and Indonesia. The mortality rate exhibited significant variation among countries, typically falling within the range of two to three per one million population throughout the region.

Like many other countries affected by COVID-19, the virus infected people of reproductive age in Asia-Pacific. Although a significant number of individuals did not exhibit any symptoms, COVID-19 mostly impacted those with pre-existing medical disorders such as cardiovascular illnesses, diabetes, chronic respiratory diseases, hypertension, obesity, and cancer. However, individuals who were undergoing fertility treatment may also have co-morbidities, making them equally susceptible to the virus [13].

In response to the COVID-19 epidemic, the Indonesian government imposed a state of emergency lasting 91 days, from February 29, 2020 to May 29, 2020. Since its initial spread, COVID-19 posed significant challenges to Indonesia's healthcare, economy, and social life. The healthcare system struggled to cope with the surge of cases with limited resources and medical facilities. The economic sector suffered significant disruptions as a result of limitations issued on social and economic activity to manage the transmission of the virus. Many small and medium-sized businesses closed down, leading to a significant

increase in unemployment rates. School closures and the transition to distance learning also adversely affected the education sector.

Despite the challenges, the government and society tried to combat the COVID-19 epidemic by implementing widespread immunization efforts, increasing healthcare service capacity, providing economic support to affected communities, and adapting to new, safer lifestyles. These collective efforts were expected to lead Indonesia out of this pandemic crisis with minimal impact and losses [10].

3.2 Impact of the pandemic on fertility services

Suspension of fertility services caused by the pandemic affected the psychological well-being and overall life satisfaction of women seeking reproductive treatments. Fear and uncertainty affected patients' attitudes towards fertility treatment [11]. The pandemic also changed antenatal care (ANC) clinic practices, such as testing infections in staff and patients, requiring mask usage, sanitation, extended opening hours, more treatment slots, and decreased clinic visits by increasing virtual consultations. The provision of information regarding preventive measures, including cleanliness processes, testing techniques for staff and patients, and policies for preserving social distancing, can effectively alleviate patient concerns inside fertility clinics. Facilitating collaborative decision-making between medical professionals and patients is crucial for addressing the potential hazards and advantages of fertility treatment amidst the ongoing epidemic. To minimize superfluous trips and interactions between staff and patients, fertility clinics should modify their offerings. Patients should be urged to utilize telemedicine for treatments that do not necessitate physical visits to clinics [9-11].

The COVID-19 epidemic has established a "new normal" condition in which countries have had to cautiously recommence fertility services. For instance, the Japan Society of Reproductive Medicine halted IVF services in April but recommenced them once the situation eased. In response to the escalating occurrences of the new normal in Vietnam from late July to early August, the government implemented stringent restrictions that were subsequently relaxed in October. To achieve greater patient confidence in getting safe fertility care, it is essential to comprehend the Asia Pacific Initiative on Reproduction (ASPIRE) Patient Experience Report (APAC) perspective on patient behavior, considering the diverse intensity and impact of the epidemic in various Asian nations. To enhance patient experience and confidence during the epidemic, a survey was conducted to identify the key drivers, primary concerns, and challenges encountered by patients undergoing fertility therapy [8-11].

3.3 Assisted reproductive technology education during COVID-19

The COVID-19 pandemic impacted the implementation of ART protocols. Several factors were identified, including the availability of healthcare facilities and medical personnel, high demand from patients needing healthcare, and restrictions on COVID-19-related medical examinations and treatments [10]. A UNICEF report revealed that households, particularly in vulnerable areas far from capital cities, faced significant barriers to accessing healthcare services during the pandemic, including reproductive health

services. Rural areas were more affected due to limited healthcare infrastructure, while urban centers saw increased pressure on medical systems [14-15]. In another study, spatial analysis showed how socioenvironmental factors, such as urbanization and population density, influenced COVID-19 spread and healthcare access across Indonesian regions [16].

To ensure couples who wanted to undergo ART programs could do so safely and appropriately, education on COVID-19 screening was crucial. An educational campaign was implemented to establish confidence, diminish the negative perception associated with COVID-19 screening, and guarantee the provision of high-quality and secure healthcare services to the population [10].

Educational activities were conducted on fertility issues related to COVID-19, and explanations of how ART services can be accessed during this pandemic were conveyed. Infertile couples understood why they needed to undergo COVID-19 screening. This understanding was crucial in ensuring the community knew the importance of COVID-19 detection and prevention. Education could help reduce stigma about COVID-19 and its relation or effect to infertility, and build public trust in COVID-19 screening. It could also help the community understand how the screening was conducted and what was expected.

Through persuasive education and the implementation of COVID-19 screening, all stakeholders might collaborate to address the COVID-19 epidemic and guarantee the delivery of high-quality and secure healthcare services to all individuals. Therefore, it was essential to continue focusing on educational activities and screening implementation [10].

3.4 Assisted reproductive technology practice in Indonesia during COVID-19

The COVID-19 pandemic led to new challenges in the practice of ART. Travel restrictions and physical distancing measures to control the virus's spread hindered ART practice. Additionally, some clinics may limit or postpone procedures to prevent the risk of COVID-19 infection. In light of these challenges, it was essential for couples undergoing ART programs to maintain open communication with their healthcare providers and explore available options to adapt to evolving situations [8].

Significant variation existed in the implementation of ART practices in Asia, including Indonesia, during the COVID-19 pandemic. This was likely due to the lack of government regulations governing ART practices, although national ART associations in Australia, India, and Thailand did issue recommendations. Most ART clinics decided to offer ART services based on expert individual assessments. Some ART clinics remained open throughout the pandemic, while others temporarily closed and reopened gradually in 2020. While all ART clinics offered intrauterine insemination (IUI), most ranked these services lower than IVF and ICSI. The fertility clinics established patient priorities based on the Patient-Oriented Strategies Encompassing Individualized Oocyte Number (POSEIDON) criteria [14]. The main priorities were cancer patients, mothers of advanced age, low ovarian reserve, a history of implantation failure, and severe male factor infertility. The decision to deliver services was greatly affected by patient preferences, with advice provided by regulatory organizations, if applicable [13].

Triage protocols were implemented by ART fertility clinics to mitigate contamination; nonetheless, there is considerable variation in the actual measures taken. Control of temperature, the administration of epidemiological questionnaires, RT-PCR tests, or both were carried out. Patients who were diagnosed with COVID-19 or had symptoms or fever were excluded from consideration for treatment. Most often used checklists before ovarian stimulation were epidemiological surveys followed by PCR, while RT-PCR (or serology) was routinely employed before oocyte pick-up (OPU). However, diagnostic tests were not routinely conducted before sperm retrieval and embryo implantation. Patients underwent post-treatment monitoring for COVID-19. While the precise figures were challenging to determine because of uneven testing, the proportion of infertile individuals who reported experiencing symptoms or a COVID-19 diagnosis before therapy or OPU was somewhat modest. Staff members carrying out their responsibilities were not subjected to regular testing, and the limited availability and accuracy of testing were frequently mentioned as obstacles to the wider implementation of testing [13].

Several studies and health reports suggested a delay in ART service for couples amidst the COVID-19 pandemic. This might be a hard decision for the couples who wait for long and still suggested waiting more in the uncertain condition of the pandemic at that time. Other than that, some studies still allow couples to undergo the treatments, but with very tight health protocols and several tests before doing so [17]. This condition might arouse new problems for the couples, such as emotional burden, anxiety, or fatigue [18]. One study from Yogyakarta reports resilience in a woman who undergoes IVF amidst the COVID-19 pandemic. This study shows that a woman with infertility problems still has optimism even though there was some delayed treatment during the pandemic [19]. One study in Medan, West Sumatra, reports that there are significant differences in economic levels geographical and socio-cultural patient urban and rural areas in access to infertility services [20].

3.5 Guidelines for organizing assisted reproductive technology during COVID-19 in Indonesia

The ASPIRE guidelines provide recommendations for assessing ART services during the COVID-19 pandemic based on current practices in the Asia Pacific region. These recommendations include 14 best practices to assist in service implementation. The timing of ART services became crucial, especially for patients with certain infertility conditions, such as cancer patients, elderly patients, and patients with severe male factor infertility. Safety aspects in ART are also important, with discussions on optimal ovarian stimulation protocols to avoid complications such as ovarium hyperstimulation syndrome (OHSS). Additionally, the organization of ART services should have considered adequate medical infrastructure, test availability, and cost needed for patients and clinics [12-13].

However, there was still much unknown about the implications of COVID-19 on reproductive health, particularly regarding the risks for pregnant women. The assumption that pregnant women were more vulnerable to complications still needs further review by critically and objectively examining data. Serological testing could be

a determining factor in identifying patients with immunity, but additional research is required [13].

3.6 Recommendations

Based on research findings, recommendations are suggested to improve the implementation of ART during the COVID-19 pandemic in Indonesia. Conducting in-depth research on the psychosocial impacts of the pandemic on infertile patients in Indonesia. This analysis should include measuring the levels of anxiety, depression, and the stress experienced by patients, as well as the factors affecting them. Investigate the implementation of health protocols during ANC and ART services in various clinics and reproductive health facilities in Indonesia. It is also essential to evaluate the effectiveness and compliance of these protocols. Comparing national and international guidelines in providing reproductive health services during the pandemic, focusing on differences, similarities, and the need for adjustments to the Indonesian context. Examining the economic impact of the pandemic on infertile patients and reproductive health service providers in Indonesia. This analysis should include assessing decreased accessibility, potential additional costs incurred, and mitigation strategies that can be adopted. Investigating the effectiveness of reproductive health service adaptations, such as telemedicine utilization, increased treatment slots, and extended opening hours, in meeting patient needs and maintaining service quality during the pandemic. Conducting a survey on the community's knowledge, attitudes, and behaviors regarding reproductive health services during the pandemic. The survey should aim to understand public perceptions and identify information and education needs that have not been addressed.

3.7 Limitations

The study relied solely on a systematic literature review method due to limited access to journals necessary for a quantitative approach.

4 Conclusion

The COVID-19 pandemic had vast implications on different aspects of reproductive health services in Indonesia. These include immense pressure on the healthcare system, disruptions in ANC services, travel restrictions and physical distancing measures affecting ART practices and psychosocial impacts on infertile patients. Nonetheless, the government and society tried to address this pandemic, including enhancing healthcare service capacity, providing economic support for affected communities, and adapting to safer lifestyles. Evaluating health protocols, analyzing guideline implementation, and studying the financial impacts are crucial to implementing ART safely and effectively. A better understanding of the pandemic's effects and necessary interventions can help communities and healthcare providers work together to address challenges and mitigate the negative impacts on reproductive health services in Indonesia.

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