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Protection challenges of pregnant women against vertical transmission during COVID-19 epidemic: A narrative review



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This paper presents a narrative review study of 5 popular data repositories focusing on challenges of pregnant women protection during the COVID-19 pandemic. The study concludes that the likelihood of a vertical transmission of COVID-19 infection from pregnant women to neonates was not observed. Nevertheless, it remains a serious risk for them during their earlier stage of pregnancy, thus, special attention from health professionals has been recommended.

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INTRODUCTION

Vulnerable populations require intensive care during the outbreak of communicable diseases. Extensive measures are undertaken to ensure that the vulnerable population gets the appropriate protection and treatment. Pregnant women are a crucial part of the vulnerable population. Frontline pregnant staff working for the protection of patients with COVID-19 perform their jobs with adverse fatal effects.¹ Pregnant women thus become easily exposed to respiratory diseases that are associated with increased infection morbidity.² Human coronavirus infections are known to remain mild, as opposed to the “Middle East Coronavirus” and “Severe Acute Respiratory Syndrome” (SARS) coronavirus, which occurred in the past 2 decades, and were grave.³ The latter mentioned infections resulted in the deaths of one third of the population of women infected with these infections. An outbreak of SARS-CoV-2 in the near past has been declared a pandemic and it is predicted to be at its peak in USA, Europe and many other developing countries around the end of April, or in first 2 weeks

of May 2020. With its speedy transmission across the globe, we want to see how pregnant women are protected against the COVID-19 pandemic.

During the outbreak of infectious disease, pregnant women have an adverse influence on their cardiovascular system. As a result, rapid progression occurs due to respiratory failure in gravida. Moreover, T-helper 2 system leaves pregnant women vulnerable to viral infections.¹³ These challenges mandate the integrated strategies to women pregnancies, which are affected by COVID-19 disease. Pregnant women have heightened fear regarding the safety of their unborn fetus.¹⁴ The outbreak of COVID-19 has profoundly challenged the health system and clinicians' practices, which go in maternity units. Without appropriate guidelines and practical approaches, communication with obstetricians regarding their practices has rapidly emerged, and clinicians require guidelines in the challenges time.¹⁵ Besides, sometimes care providers are pregnant themselves, and they have added a level of concern regarding their health and their unborn babies. Therefore, the UK Royal College of Obstetricians and Gynecologists has recommended that a health worker with more than 28 weeks pregnancy avoid the direct contact with COVID-19 patients.¹⁶

In this paper, we present the narrative review of published works on various themes related with challenges when it comes to the protection of pregnant women. We study deeper into how pregnant women are safe during the acute COVID-19 pandemic around the world. As of now, there is no specific country-wise real-world data of pregnant women with COVID-19 infection. However, some published works present the cases of pregnant women for specific cases in a few countries.

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Authors contribution: This narrative review was presented by the combined efforts of the above-listed authors. The first author (MH) prepared the initial draft of the article, and colleague author (MFP) proofread it and finalized the manuscript for review, (IG) as the second colleague author fixed the typos and grammatical errors, and formatted the paper according to the style of the Journal, while (RB) as the third colleague author addressed the reviewer comments and finalized the manuscript.

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METHODS

A narrative review of emerging literature on pregnant women with COVID-19 infections and challenges to their protection is conducted on April 15, 2020. The search strategy used in this paper is based on key terms such as “pregnant women” or “protection” AND “Coronavirus 2019”, or “COVID-19” with the English language. Search key terms were applied to Science Direct, PubMed, Web of Science, Ovid Medline and Springer data repositories. The search strategy of studies was completed independently by each of the authors. As a result of the searches, 550 articles were yielded.

The inclusion criteria for this study consisted of the emerging literature on pregnant women with COVID-19 infection, which was published between December 1, 2019 and April 15, 2020. The exclusion criteria of studies involved any study which discussed challenges of pregnant women without the COVID-19 infection. All those studies which were focused on pregnant women and their challenges, without any discussion on COVID-19, were excluded. Additionally, the articles which were written in languages other than English were also excluded. Since we had no facility to translate the articles in German and French languages to the English language and therefore, we excluded them. Research studies published before the dates, as mentioned earlier, were excluded. After examining the titles and abstracts, if abstracts were not available, those articles were not counted.¹⁷ We performed screening of the articles by checking the

abstracts and removed any duplicate articles. As a result of the screening of articles, 18 articles remained. Following this, we performed the full-text analysis of the remaining 18 articles, as result of which, we removed 6 articles that did not meet the inclusion criteria. Studies^{10,11} were published on February 12, 2020. The rest of the studies have been published afterward. The inclusion and exclusion processes are summarized using the PRISMA flowchart in [Figure 1](#). Data on pregnant women with COVID-19, vertical transmission, healthcare systems, COVID-19 and impact on newborns was collected. The quality of the selected papers was evaluated by colleague author (M.F.P.). We could not conduct the meta-analysis because of the short timeframe for this narrative review, and the fact that the number of chosen studies was only a few.

RESULTS AND DISCUSSION

This section aims to present results and discussion as follows:

According to extracted information in [Table 1](#), studies⁴⁻¹² attempt to highlight the pregnant women’s protection challenges during the COVID-19 pandemic. From these studies, we have identified 4 features alongside their disadvantages due to lack of facilities, consequences, and preferred solutions presented in the focused studies. Moreover, we state the countries which are used for COVID-19 information regarding pregnant women protection challenges. As shown in [Table 1](#), most studies were undertaken in the context of data

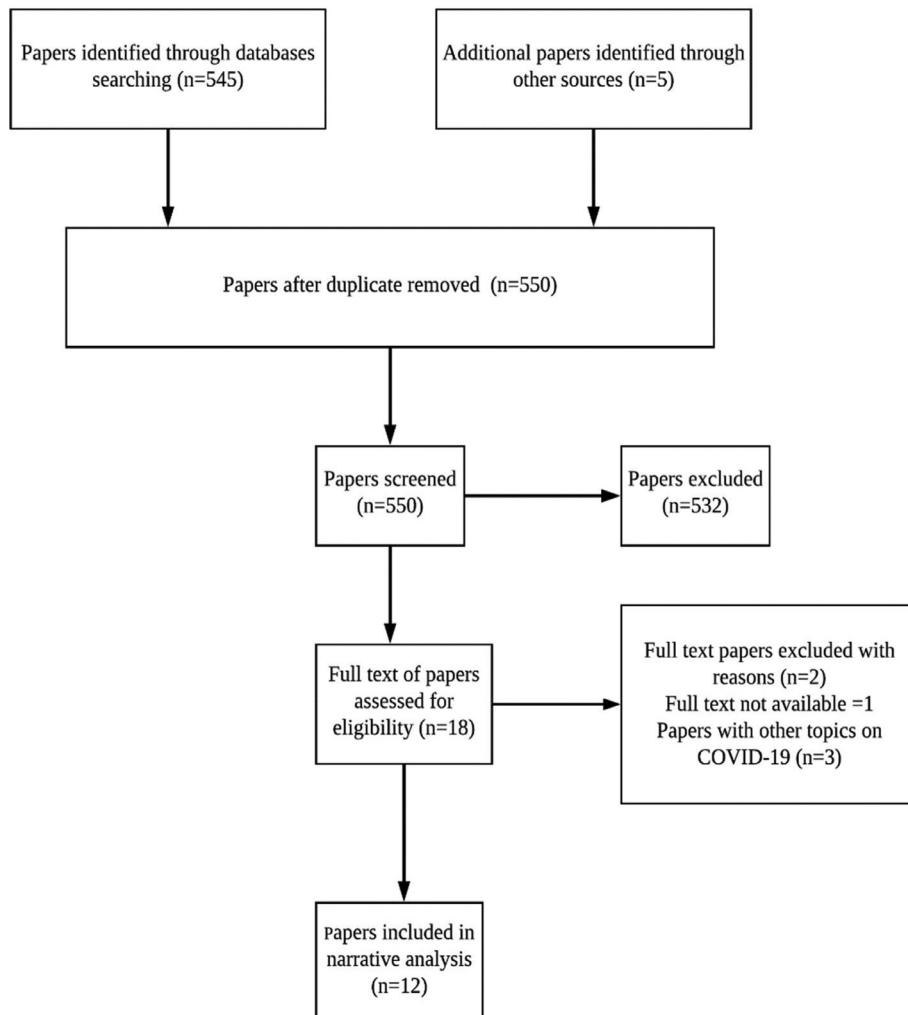


Fig 1. PRISMA flowchart showing the process of the identification of papers included in this narrative review.

Table 1
Main features of the included studies

Main Feature	Disadvantages	Consequences	Preferred solution	Target countries	Ref.
Healthcare system	<ul style="list-style-type: none"> Lack of healthcare system resources. Delayed access to a healthcare system 	<ul style="list-style-type: none"> Stillbirths, Preterm Deliveries Maternal Mortality and Respiratory Complications 	<ul style="list-style-type: none"> Cesarean delivery 	<ul style="list-style-type: none"> Singapore China 	4,5
Medicine unavailability	<ul style="list-style-type: none"> The challenging risk for countries with a higher mortality rate 	<ul style="list-style-type: none"> Shortage of Reproductive medicine 	<ul style="list-style-type: none"> To ensure the availability of reproductive medicines 	<ul style="list-style-type: none"> Italy, USA, and Mexico 	6
Higher susceptibility	<ul style="list-style-type: none"> Increase in the transmission of COVID-19 infection The risk for pregnant women, and their family newborns 	<ul style="list-style-type: none"> Cardiovascular and Hypertension Disease. Preterm Deliveries Shortness of breathing, Vomiting, Higher heart rate, Diffuse rashes, and moaning Increase in preterm labor cases 	<ul style="list-style-type: none"> Recommended more top care of both pregnant women and their neonates in intensive care units Particular recommendations for antepartum, intrapartum and postpartum care 	<ul style="list-style-type: none"> China China Canada and China 	7-9
COVID-19 vertical transmission	<ul style="list-style-type: none"> Potential risks of transmission Foreign fetal antigen challenges 	<ul style="list-style-type: none"> Variation in hormones Severe disorder in the immune system 	<ul style="list-style-type: none"> Special care of pregnant women at the first and second trimester of pregnancy Vaccine for pregnant women is especially recommended 	<ul style="list-style-type: none"> Singapore China China China China 	4,8,10-12

collected from mainland China. However, the study⁶ includes the COVID-19 information from 3 countries, such as Italy, USA, and Mexico. Moreover, the study⁴ is based on the data of COVID-19 infection from Singapore. In the following, we present a detailed discussion of the studies regarding the identified 4 features.

Healthcare system availability for pregnant women in the COVID-19 situation

Healthcare of women is critical during times of crisis. Pregnant women require more attention in comparison with other women. During pandemics, resources funnel away from the reproductive health system to the urgent focused targets which are pressing the world. However, it is known that pregnant women, in search of safety, rely more on the accessible health system for a successful childbirth.⁴ The consequences of delayed access to a health system for them are stillbirths, preterm deliveries, maternal mortality and respiratory complications. Regardless of these consequences, Ashokka et al⁴ state that vertical transmission of COVID-19 from pregnant women with infections to a fetus remained unlikely in several cases in Singapore. However, in emergency times, the cesarean method is suggested, as mentioned in many studies. It is also suggested to avoid the complications produced by the maternal and fetal conditions related with the COVID-19 pandemic.

A recent study has shown that the SARS-COV2 virus is not detected in the breast milk, amniotic fluid and cord blood in women who have been infected with SARS-COV2. It was also indicated that all neonates were free from infection. During the SARS epidemic, the virus disease remained lower in neonates as compared to adults. This might be due to the difficulty of the vertical transmission of the virus. The same study has also revealed that COVID-19 not only adversely affects lungs, but it also weakens the functioning of kidneys and testicles. So at this stage of research on COVID-19, it cannot be ruled out that COVID-19 may have an impact on the placenta. Therefore, for the safety of pregnant women and neonates, the elective Cesarean delivery is the best option in this crisis time of the COVID-19 pandemic. However, cesarean delivery time is crucial for both physicians and medical staff, because a COVID-19 infection can quickly deteriorate the functioning of the lungs. So, pregnant women and neonates, along with the physicians and nurses, must meet safety measures in operation theatre rooms. Apart from this, biosafety measures need to be followed by medical staff when they enter or leave the operation

theatre rooms.⁵ These safety measures are discussed with regards to a study performed with respect to Chinese populations with the help of Wuhan University China. This study is a preliminary effort by researchers regarding the safety of women and neonates, and similar measures must be necessarily taken in other countries, which are at great risk of COVID-19 at this present time.

Challenges of medicine unavailability during crisis time of COVID-19 infection

Italy is the second highest country after USA with mortalities occurring due to the current COVID-19 pandemic. To date (12 April, 2020) a total of 19468 deaths have occurred in Italy. They still have 100269 active cases. This data has been collected from Worldometers. Italy has profoundly adapted to its health reproductive system during the crisis time. Although, COVID-19 is a real challenge to health care systems, recommendations have been proposed to provide safer healthy measures to pregnant women in Italy. They have strongly recommended the cancellation of transfers of frozen or fresh embryos. It has been remarked by them that “We fear the worst is yet to come.”⁶ This statement is not only mirroring the situation prevailing in Mexico but also in many other countries of the world, where no measures have been taken to prevent the outbreak of COVID-19. No substantive measures are currently underway to break the power of the COVID-19 pandemic. The non-availability of reproductive medicine in Italy is a challenging risk. Therefore, we need to educate ourselves and suggest more measures to ensure the availability of medicine, which is one of the essential requirements of a reproductive system.

Pregnant women are susceptible to the COVID-19 infection

Pregnant women, neonates, and adults with cardiovascular and hypertension disease are known to be more susceptible to the COVID-19 infection. Therefore, they require additional care in the intensive care units. Naicker et al⁷ in a recently published research have stated that 7184 patients with hemodialysis (HD) were treated in Renmin Hospital, Wuhan. This research further reveals that 7 patients on HD died due to cardiovascular disease and no direct link with the COVID-19 infection was found among the dead patients.

However, intensive HD conditions in patients pose challenges for patients with the COVID-19 infection. Patients at this phase show a

significant increase in the transmission of infections. Medical staff, family members and facility workers also become at a higher risk from these transmitted infections.

The research by Liu et al.⁸ has an evidence of our claim that there is no vertical transmission of coronavirus in pregnant women. In addition, it has also been revealed that preterm deliveries have occurred. It is challenging for the researchers to know whether preterm deliveries occur due to COVID-19 infection or are there other complications that result in preterm deliveries in pregnant women with the COVID-19 infection. In the above mentioned study, researchers have presented a review of several studies to investigate the causes of women becoming susceptible to the COVID-19 infection. In contrast to the findings of studies reviewed in this paper, the earlier review studies presented that neonates and pregnant women were easily susceptible to COVID-19 infection. One neonate with COVID-19 reportedly died due to multiple apparent symptoms such a shortness of breathing, vomiting, higher heart rate, diffuse rashes, and moaning. Nevertheless, no evidence was presented to show that the death of neonate was due to a transmission of the COVID-19 infection.

In a recently published research, Elwood et al.⁹ presented a comparison of the impacts of COVID-19 with the effects of Middle East Coronavirus and SARS on pregnant women and their fetuses. The findings of the study indicated that per-case-fatality rate was lower among women infected with COVID-19. The outcome of pregnancies among women with COVID-19 remained well. However, an increasing number of preterm labor cases have been reported. Overall, it has been stated that no evidence of vertical transmission has been reported. Furthermore, viral RNA has not been detected among pregnant women with COVID-19, which supports the fact that vertical transmission is unlikely.

Potential risks of vertical transmission of COVID-19 infection to pregnant women and neonates

Potential risks of vertical transmission of COVID-19 infection have been considered in various studies.^{4,8,10} However, we need more evidence to develop clinical evidence and preventive strategies. Chen et al.¹¹ conducted a study on the vertical transmission of the COVID-19 infection from pregnant women to neonates. However, the findings of the study indicated that pregnant women with COVID-19 did not show any different symptoms as compared to non-pregnant women without the COVID-19 infection. Based on the findings of the above-mentioned studies, we are still not convinced, because many complications arising in pregnant women cannot be linked to COVID-19 at the present time. A study suggested that pregnant women require special attention during the first and second trimester of pregnancy, because at these stages, hormones and the immune system show many variations. Foreign fetal antigen poses challenges to the normal functioning of a woman's immune system. The immune system of women keeps adjusting the balance till the time period of late pregnancy.¹² However, serious immune system disorders may occur if COVID-19 infects the women at the earlier stages of pregnancy. Previous studies have also shown that SARS 2003 and H1N1 2009 created serious complications in mothers and neonates. Based

on the evidence, we should be careful of the COVID-19 infection when it comes to pregnant women, throughout the pregnancy stages.

CONCLUSION

Recent works have suggested that pregnant women do not show any vertical transmission of the COVID-19 infection. We find that majority of the reviewed studies have recommended that pregnant women must be given special attention at the earlier stages of their pregnancy. The immune system of pregnant women keeps stabilizing the balance of hormones from earlier stages to the trimester stage of pregnancy. This review study also finds that the non-availability of health systems due to the COVID-19 pandemic creates more complications for pregnant women, especially those who seek treatment in intensive care units.

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