Estimating the Repercussions of Covid-19 in Pregnancy and Neonatal Complications

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Abstract

The chief goal of this article was to do a literature review on a sensitive topic that has affected many people worldwide. COVID-19 was declared as a pandemic as it crossed all the boundaries. The effects of COVID-19 infection were seen globally, affecting every individual of the society. But here, the main intention was to study the impact of COVID-19 illness in pregnancy since pregnancy is an immune-compromised condition. The effects that had on pregnancy were preterm labor, premature birth, pre-eclampsia, and miscarriages. The other objective was to study the neonatal outcomes, which showed fetal respiratory distress syndrome, Prolonged QT.

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ABSTRACT

The chief goal of this article was to do a literature review on a sensitive topic that has affected many people worldwide. COVID-19 was declared as a pandemic as it crossed all the boundaries. The effects of COVID-19 infection were seen globally, affecting every individual of the society. But here, the main intention was to study the impact of COVID- 19 illness in pregnancy since pregnancy is an immune-compromised condition. The effects that had on pregnancy were preterm labor, premature birth, preeclampsia, and miscarriages. The other objective was to study the neonatal outcomes, which showed fetal respiratory distress syndrome, Prolonged QT interval. Right now, no records are mentioning regarding the vertical transmission from the mother to the child in COVID- 19 infection.

INTRODUCTION

The 2019 coronavirus was announced as pandemic on 11th March 2020. It was found in China in December 2019 (Chaolin Huang*, 2020). The patients presented with symptoms like fever, fatigue, dry cough, dyspnea, and respiratory distress (Lina Antoun, 2020). Coronavirus is an ssRNA, non-segmented, and enveloped, causing illnesses from a common cold to severe fatal disease (Sonja A. Rasmussen, John C. Smulian, John A. Lednicky, Tony S. Wen, & Denise J. Jamieson, 2020). In the present time, only limited data is available about the effects of the virus, but it does show that its clinical course is very severe in pregnancy (Sonja A. Rasmussen, John C. Smulian, John A. Lednicky, Tony S. Wen, & Denise J. Jamieson, 2020).

Pregnancy is a condition that is prone to infections than the average population. It is also proven that pregnancy is a significant risk factor for COVID-19 infection (Wendy N. Phoswa, 2020). Pregnant women may not only have increased chances of complications but also an increased rate of mortality (Sbaa Syeda, 2020). Since pregnancy is a risk factor and fetuses are affected too, more studies are taking place to gain information about the transmission, symptoms, investigations, treatment, and infection complications due to COVID-19. Data suggests that pregnant women suffering from COVID-19 infection are at an increased likelihood of miscarriage, preeclampsia, C-section, and perinatal death (Daniele Di Mascio, et al., 2020). There are no published cases in the current condition suggesting vertical transmission (Daniele Di Mascio, et al., 2020). Royal College of Obstetrics and Gynaecology recommends that the delivery of a COVID-19 positive pregnant patient should be set fundamentally on obstetric indication (Lina Antoun, 2020). This study imparts an understanding of the effects of COVID-19 infection in pregnancy and focuses on neonatal health.

PRELIMINARY THESIS

As of now, every individual is susceptible to COVID-19 infection irrespective of his health status. Pregnancy is an immune-compromised state which increases the susceptibility towards the infection. Hence, maternal and neonatal complications become an obvious thing to happen. Studies have revealed some significant complications in COVID-19 infected pregnant women like prematurity, maternal death, preeclampsia, etc. Neonatal complications are also seen but are rare and are due to anti- inflammatory actions taking place in the maternal body. No evidence was found regarding vertical transmission, and hence it can be a great topic of interest amongst researchers in the future.

AIM AND OBJECTIVES

This study aimed to understand the consequences of infection with the novel coronavirus in pregnancy and assess neonatal out-turns. A few kinds of research have taken place, but how much ever data is known shows that the spectrum of pregnancy outcomes is very severe. Yet no literature shares information about vertical transmission.

Some specific objectives:-

1. Complications in pregnancy due to COVID-19 infection.
2. Neonatal outcomes.

METHOD

In identifying the resources for this literature, many articles were taken into consideration. This is a systematic review of many research papers concerning the effects of COVID-19 on pregnant women and neonatal complications. This article was reviewed from many sites such as PUBMED, science direct, and WHO's official site. The keywords used for this article were COVID-19, pregnancy, immunity, neonate. Many studies were held like a prospective or retrospective cohort, systemic review, and meta- analysis. Still, one study that caught my attention and was very much relatable to this topic was selected.

It goes as follows, a Prospective cohort study was held in February 2020 on 23 pregnant women from a maternity home. Required tests were done to find out how many of them were infected by COVID-19 infection. Nasopharyngeal swabs of the mother and the neonate were taken, and the diagnosis was confirmed by RT-PCR, chest X-ray, and CT scan (Lina Antoun, 2020).

CLINICAL SIGNS AND SYMPTOMS OF COVID-19

The incubation period of COVID-19 infection is 5-6 days but can even go up to 14 days (World Health Organization). It is reported that the infection has three stages, out of which the first stage is called the incubation stage. In this stage, the patient can go undetected because the patient is asymptomatic. In step two, the virus becomes detectable, and the patient comes with mild symptoms like fever. In stage three, the symptoms become severe, resulting in respiratory distress and death (Dawei Wang, et al., 2020). Other symptoms seen are headache, cough, fatigue, hemoptysis, diarrhea, etc. (Chaolin Huang*, 2020), (Li-Li Ren1, 2020), (Weier Wang MB1, 2020), (W. Graham Carlos, 2020).

THE FUNCTION OF MATERNAL IMMUNE SYSTEM IN COVID-19 INFECTION

Since pregnancy, immunity is already decreased, pregnant women are more susceptible to getting infected by an organism than the usual population. The maternal immune system is prepared to fight against the organism. First-line defense cells like NK cells and monocytes are ready to face viral challenges while some are down-regulated in pregnancy like B and T cells (Hong Liu, 2020).

A study held in Wuhan, China, showed that during COVID-19 infection, neutrophils are increased, and lymphocytes are decreased. This change in immune cells' levels is directly related to disease severity and, eventually, death (Fan Wu, 2020). It was also found that NK cells and T cells were decreased, which are critical immune cells. Pro- inflammatory cytokines increase during the infection (Chaolin Huang*, 2020) (Guang Chen, 2020).

In pregnancy, it is seen that 1st trimester is pro-inflammatory, 2nd trimester is anti- inflammatory, and 3rd trimester is again pro-inflammatory. In 2nd trimester, the baby's growth is faster, and maternal health improves compared to 1st trimester (Gil Mor, 2020). During delivery pro-inflammatory phase is activated to protect the baby and placenta.
Corona infection occurs during the pro-inflammatory phase, and hence it is easy to contract the infection in the 1st and 2nd trimester (Wendy N. Phoswa, 2020). Placenta has anti-microbial action that induces the immune system, which protects the baby but does not guarantee maternal protection. (Gil Mor, 2020).

SEVERITY OF DISEASE

Lung manifestations:

In pregnant women with COVID-19 infection, it is indispensable to perform a pulmonary assessment (Jeong Yee, 2020). Tests such as ABG analysis, physical examination, oxygen saturation, imaging like CT scan should be performed. WHO recommends that a higher oxygenation goal be attained in COVID-19 pregnant women in favor of fetal benefits (Sbaa Syeda, 2020). If a pregnant woman develops hypercapnia, the fetus is at increased risk of developing respiratory acidosis (KLOCKE, 2020). Chest imaging findings showed mixed or complete consolidations (Huanhuan Liu, 2020).

Hematological manifestations:

It is seen that the pathological status of COVID-19 infection shows pro-inflammatory and prothrombotic states (Ricardo J Jose, 2020). Also, the levels of inflammatory parameters are supposedly increased like C- reactive protein, erythrocyte sedimentation rate, LDH, and ferritin. There is an activation of coagulation pathways leading to a prothrombotic state. Patients are at high risk of developing arterial or venous thrombi, and, therefore, heparin is recommended by WHO in pregnancy and the postpartum period (Behnood Bikdeli, 2020).

Cardiac manifestations:

In pregnancy, maternal and fetal metabolic needs are increased, leading to hemodynamic changes. Here, cardiovascular complications include myocardial infarction, cardiomyopathy, and arrhythmia (Brit Long, 2020). Pregnant patients with existing cardiac or metabolic diseases should be assessed closely to avoid future complications (Sbaa Syeda, 2020).

Liver manifestations:

In obstetric patients, laboratory findings must be considered because it may coincide with other obstetric conditions such as HELLP syndrome and preeclampsia (Sbaa Syeda, 2020).

Neurological manifestations:

CNS manifestations include headache, dizziness, impaired consciousness, ataxia, and seizures. Peripheral system manifestations include nerve pain and taste, smell, and vision impairment. Skeletal, muscular presentations include skeletal muscle pain with increased creatinine kinase levels. Headache, acute cerebrovascular disease, and seizures may coach towards an investigation for preeclampsia (Sbaa Syeda, 2020).

Kidney manifestations:

Fluid resuscitation in pregnant women should be done carefully as plasma and interstitial oncotic pressure falls, but later as the pregnancy progresses, it decreases to a greater extent. Capillary hydrostatic pressure increases. Both these forces lead to extravascular water movement to interstitial space in pregnancy, increasing the chances of pulmonary edema (Sbaa Syeda, 2020).

RESULTS

As many articles were reviewed to find out, the effects one of the articles caught my attention, and it goes as follows. A prospective cohort study was carried out in which 23 women were pregnant, out of which 19 women tested positive for COVID-19 infection. 19 women were in their 3rd trimester and gave birth to 20 babies out of which one had twins.

Maternal consequences:

The mean age of all the 23 women was 29 years old. Some of them presented with comorbidities such as hypertension, diabetes, asthma, and preeclampsia. One of them had hypertension, one has anti S antibodies, and one had hyperthyroidism. Hepatitis B. One maternal death was reported due to basilar artery thrombosis concurrently with pulmonary embolism. (Lina Antoun, 2020)

Out of 19, one woman had a miscarriage at 13 weeks of gestation. One had pyelonephritis along with acute kidney injury. Out of 19, 7 women delivered preterm babies with gestational weeks ranging between 29 and 36 weeks. Out of these 7 premature deliveries, 4 had preterm pre-labor rupture of membranes. 3 women suffered from acute respiratory distress syndrome. One patient developed liver dysfunction, HELLP syndrome, and eventually DIC. (Lina Antoun, 2020)

Neonatal consequences:

A majority of neonates (95%) did not require resuscitation. (Lina Antoun, 2020). Some neonates showed features like tachycardia, mild respiratory distress, and prolonged QT interval, while in one neonate, fever and cough were found on the day of delivery (Christine M Salvatore, 2020). However, neonates' stillbirth and the mortality rate have increased, but there is not much-established information about the transmission of neonates' infection. In other words, neonates are at not much risk of acquiring COVID- 19 infection. Data also shows that if proper hygiene is maintained, then the perinatal transmission is implausible (Christine M Salvatore, 2020).

MANAGEMENT OF COVID-19 IN PREGNANCY

Right now, there are no pieces of evidence confirming the vertical transmission. However, it is shown that the infection in mother and inflammatory mediators has some effects on the neonate (Hong Liu, 2020). Antivirals can be given to the patients to stop the disease

progression, but there is no specific treatment. Symptomatic treatment is the only specified treatment in pregnancy (Pradip Dashraath, et al., 2020). That is why in such cases, fetal surveillance is of great importance because changes in fetal heart rate can indicate declining maternal health (Sonja A. Rasmussen, John C. Smulian, John A. Lednicky, Tony S. Wen, & Denise J. Jamieson, 2020).

CONCLUSION

There is no specific treatment in the management of COVID-19 infection, and no confirmed vaccine has been discovered. The world is facing this pandemic for the first time against COVID-19, so there is no established herd immunity in society. Since there is no herd immunity, every healthy individual is susceptible to get infected by the coronavirus. Still, pregnant women are at greater risk of having infection with coronavirus due to their altered physiological changes. This is suggestive that pregnancy is a risk factor for COVID-19 infection.

Studies show a widespread presence of preterm birth, preeclampsia, and C-section in COVID-19 infected pregnant women. There is not much information confirming about vertical transmission. Neonatal complications can happen, but they are rare. It is seen that the anti-inflammatory reaction taking place in mothers affects neonates the most. To save women and newborns from the impact of COVID-19 infection during pregnancy, fetal surveillance is of great importance, especially in the 1st and 2nd trimester. Also, it is very important to avoid cross infections in pregnancy.

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Table 1- The below table shows clinical and follows up data of 23 pregnant women infected with COVID-19 infection.

Clinical features:-		**Citation:-**
Maternal age	16-49 years, mean age was	(Lina Antoun, 2020)
	29.3	
Pregnancy comorbidities	DM, gestational diabetes, asthma, hyperthyroidism, AKI, pyelonephritis	(Lina Antoun, 2020)
Adverse pregnancy outcomes	Preterm delivery, miscarriage, PPROM, preeclampsia, HELLP, DIC, fetal distress	(Lina Antoun, 2020)
Signs and symptoms:-	Antenatal/intranatal fever, postpartum fever, diarrhea, abdominal pain, shortness of breath, cough.	(Lina Antoun, 2020)
Maternal outcome:-		
Antepartum/intrapartum	Pyelonephritis, PPH	(Lina Antoun, 2020)
Postnatal	PPH, Extracorporeal membrane oxygenation	(Lina Antoun, 2020)
Neonatal outcomes:-	Low birth weight, bacterial pneumonia, fetal asphyxia	(Lina Antoun, 2020)