IMPACT OF ACUTE RESPIRATORY INFECTIONS ON PREGNANCY OUTCOMES IN THE POST-COVID PERIOD

G.F. Rajapova
Assistant, Tashkent State Medical Unversity
https://doi.org/10.5281/zenodo.20266761

Abstract. *The COVID-19 pandemic has significantly altered the global healthcare landscape and has become one of the most critical public health challenges of the twenty-first century. Pregnant women constitute a particularly vulnerable group due to physiological, immunological, and respiratory changes occurring during gestation. In the post-COVID period, the persistence of inflammatory responses, endothelial dysfunction, immune dysregulation, and thrombotic complications has increased the susceptibility of pregnant women to acute respiratory infections and associated obstetric complications. This article analyzes the relationship between acute respiratory infections and obstetric outcomes in pregnant women during the post-COVID era. Particular attention is given to the pathophysiological mechanisms underlying pregnancy complications, including hypoxia, cytokine-mediated inflammation, placental insufficiency, and coagulation disorders. The study also examines diagnostic approaches, monitoring strategies, preventive measures, and modern therapeutic interventions. International clinical recommendations and current challenges in maternal healthcare are additionally discussed. The findings indicate that post-COVID physiological alterations substantially increase the risk of preeclampsia, preterm birth, fetal hypoxia, and perinatal complications, emphasizing the need for comprehensive prenatal monitoring and multidisciplinary management.*

Keywords: *post-COVID syndrome, pregnancy, acute respiratory infections, obstetric complications, preeclampsia, fetal hypoxia, placental insufficiency, thrombosis, respiratory diseases, maternal health.*

Introduction

The COVID-19 pandemic produced unprecedented medical, social, and economic consequences worldwide. Although the acute phase of the pandemic has gradually declined, its long-term effects continue to influence healthcare systems globally. One of the most concerning consequences is the emergence of post-COVID syndrome, characterized by persistent clinical manifestations and multisystem complications after recovery from acute SARS-CoV-2 infection. These complications are particularly significant in pregnant women, whose physiological condition already involves substantial immunological and cardiopulmonary adaptations. Globally, the COVID-19 epidemic had hitherto unheard-of medical, societal, and economic repercussions. Even while the pandemic's acute phase has gradually subsided, its long-term effects are still having an impact on healthcare systems around the world. The development of post-COVID syndrome, which is marked by multisystem problems and persistent clinical symptoms following recovery from acute SARS-CoV-2 infection, is one of the most worrisome outcomes. Because pregnant women already have strong immunological and cardiac adaptations, these issues are more important for them.

Persistent inflammatory activation, endothelial damage, microvascular dysfunction, and aberrant coagulation may worsen pregnancy outcomes in the post-COVID era. Maternal

oxygenation can be lowered by persistent inflammatory processes and residual lung impairment, which can impact placental circulation and fetal development. Moreover, placental vascular insufficiency and unfavourable obstetric outcomes may be exacerbated by the elevated thrombotic risk linked to post-COVID syndrome. After the pandemic, pregnant women are experiencing an increasing number of respiratory infections, according to recent epidemiological observations. Maternal morbidity is still largely caused by bacterial and viral respiratory illnesses, such as bronchitis, pneumonia, influenza, and respiratory syncytial virus (RSV) infection. Preterm labour, fetal growth restriction, preeclampsia, intrauterine hypoxia, and spontaneous abortion are among the problems that are increasingly linked to these disorders.

Materials and Methods

Post-COVID syndrome, also referred to as "long COVID," is defined as the persistence of clinical symptoms and pathological changes for weeks or months following acute COVID-19 infection. The syndrome affects multiple organ systems and may develop even after mild or asymptomatic infection.

The clinical manifestations of post-COVID syndrome include:

- ✓ chronic fatigue,
- ✓ dyspnea,
- ✓ persistent cough,
- ✓ chest discomfort,
- ✓ cognitive dysfunction,
- ✓ sleep disturbances,
- ✓ endothelial injury,
- ✓ coagulation abnormalities.

Results

One of the most common consequences is respiratory symptoms. Persistent inflammation in the pulmonary tissues might lower oxygen saturation levels and hinder gas exchange. This syndrome may seriously impair the oxygen flow to both the mother and the fetus in pregnant women, whose oxygen demand is physiologically elevated. Endothelial dysfunction is one of the main processes behind post-COVID syndrome. Through immunological and inflammatory mechanisms, SARS-CoV-2 infection harms vascular endothelial cells, impairing microcirculation and raising the risk of thrombosis. Endothelial dysfunction during pregnancy is closely linked to hypertensive conditions including preeclampsia and placental insufficiency. Microthrombotic processes may additionally disrupt placental perfusion. Reduced uteroplacental blood flow impairs nutrient and oxygen delivery to the fetus, increasing the likelihood of intrauterine growth restriction and fetal hypoxia. Another important factor involves immune dysregulation. Pregnancy itself represents a state of modified immunity intended to protect the fetus while preserving maternal defense mechanisms. Post-COVID immune imbalance may exaggerate inflammatory responses and increase susceptibility to secondary respiratory infections. Consequently, pregnant women recovering from COVID-19 may experience more severe respiratory illnesses and poorer obstetric outcomes.

Acute respiratory infections remain among the most common illnesses affecting pregnant women. During the post-COVID period, increased incidence and severity of respiratory infections have been observed in vulnerable populations.

The most clinically significant respiratory infections during pregnancy include:

- ❖ influenza,

- RSV infection,
- bacterial pneumonia,
- acute bronchitis,
- recurrent viral respiratory diseases.

Respiratory infections during pregnancy are associated with several pathological mechanisms capable of affecting both maternal and fetal health.

Oxygen exchange capacity is decreased by respiratory impairment and pulmonary inflammation.

Persistent maternal fever may negatively influence fetal development, especially during early gestation. Hyperthermia may additionally intensify metabolic stress and inflammatory activity.

Tumour necrosis factor-alpha and interleukins are among the inflammatory mediators and cytokines that are released in response to acute respiratory infections. Premature uterine contractions and placental dysfunction may be caused by excessive inflammatory activity.

Inflammatory vascular injury and coagulation abnormalities may compromise placental blood flow, resulting in fetal growth restriction and chronic intrauterine hypoxia.

One of the most frequently reported complications is preterm delivery. Systemic inflammation, maternal hypoxia, and cytokine activation may trigger premature uterine activity and membrane rupture. Several clinical studies indicate that pregnant women with severe respiratory infections demonstrate significantly higher rates of preterm labor compared to healthy pregnant populations.

Post-COVID endothelial dysfunction substantially increases the risk of hypertensive disorders during pregnancy. Impaired vascular regulation and placental ischemia contribute to the development of preeclampsia, characterized by hypertension, proteinuria, and systemic organ involvement.

Maternal respiratory compromise may decrease fetal oxygenation. Prolonged intrauterine hypoxia can negatively affect fetal neurological and cardiovascular development. Fetal growth may be hampered by persistent inflammation and decreased placental perfusion. Lower birth weight and developmental issues are common in infants born to mothers with severe respiratory illnesses.

Post-COVID respiratory diseases are additionally associated with:

- neonatal respiratory distress,
- low Apgar scores,
- neonatal intensive care admission,
- perinatal mortality.

Recent international studies have demonstrated that pregnant women with respiratory infections during the post-COVID period show increased incidence of preeclampsia and preterm birth compared to noninfected populations.

Discussion

Early diagnosis and comprehensive monitoring are essential for reducing obstetric risks in pregnant women with respiratory infections during the post-COVID period.

Important laboratory and clinical markers include:

- C-reactive protein (CRP),
- D-dimer,
- ferritin,

- complete blood count,
- oxygen saturation monitoring (SpO_2).

Instrumental assessment methods include:

- ultrasonography (UTT),
- cardiotocography (CTG),
- Doppler examination of placental circulation.

Continuous fetal monitoring is particularly important in patients with moderate or severe respiratory compromise.

A multidisciplinary monitoring strategy involving obstetricians, pulmonologists, infectious disease specialists, and neonatologists is recommended for high-risk pregnancies.

Individualized and evidence-based treatment strategies are necessary for the management of respiratory infections during pregnancy.

Management of Pharmacology. Once a bacterial infection has been established, safe antibiotic therapy should be chosen. Antiviral drugs may be taken into consideration based on gestational age and clinical indications.

Treatment with Oxygen. In order to ensure appropriate maternal and fetal oxygenation, patients with respiratory insufficiency require more oxygen.

Anticoagulant Treatment. Certain patients may benefit from anticoagulant prophylaxis due to the increased thrombotic risk linked to post-COVID syndrome.

Immune System and Vitamin Support. Maternal recuperation and immunological stability may be aided by vitamin D administration and dietary support.

Immunization. One of the best ways to prevent serious respiratory illnesses during pregnancy is still vaccination. Maternal immunization improves infant outcomes and lowers complications, according to data from around the world.

International healthcare organizations have developed specific recommendations for the management of pregnancy during the post-COVID period. World Health Organization emphasizes the importance of maternal vaccination, respiratory monitoring, and continuity of prenatal care. Centers for Disease Control and Prevention identifies pregnant women as a high-risk population requiring enhanced preventive strategies and early respiratory evaluation. American College of Obstetricians and Gynecologists recommends individualized management protocols, thrombosis prevention, and close fetal surveillance in post-COVID pregnancies. These international recommendations may significantly contribute to improving maternal healthcare systems in developing countries.

In Uzbekistan, post-COVID maternal health surveillance has become increasingly important within perinatal healthcare institutions. Clinical observations indicate seasonal increases in respiratory infections among pregnant women, particularly during autumn and winter periods.

Perinatal centers have reported increased need for respiratory monitoring and multidisciplinary pregnancy management following the pandemic. However, several challenges remain unresolved.

These include:

- insufficient early diagnostic capacity,
- limited laboratory resources in certain regions,
- unequal access to specialized prenatal monitoring,
- incomplete evaluation systems for post-COVID complications.

Strengthening maternal healthcare infrastructure and expanding digital monitoring systems remain important priorities for improving obstetric outcomes.

Conclusion

The post-COVID period has introduced substantial challenges to maternal healthcare, particularly regarding the management of acute respiratory infections during pregnancy. Physiological immunosuppression, increased oxygen demand, and cardiopulmonary adaptations characteristic of pregnancy make pregnant women especially vulnerable to respiratory diseases and their complications. The persistence of inflammatory activity, endothelial dysfunction, coagulation abnormalities, and impaired immune regulation after COVID-19 infection further increases maternal and fetal risks. The analysis presented in this study demonstrates that acute respiratory infections during the post-COVID period are closely associated with adverse obstetric outcomes, including preterm birth, preeclampsia, placental insufficiency, fetal hypoxia, intrauterine growth restriction, and perinatal complications. The pathophysiological mechanisms underlying these complications involve cytokine-mediated inflammation, microvascular thrombosis, hypoxia, and placental circulatory disturbances. The study additionally highlights the importance of early diagnosis and continuous monitoring in high-risk pregnancies. Laboratory markers such as CRP, D-dimer, ferritin, and oxygen saturation levels, together with instrumental methods including ultrasonography, Doppler examination, and cardiotocography, play a significant role in preventing severe maternal and neonatal outcomes. Multidisciplinary management involving obstetricians, pulmonologists, infectious disease specialists, and neonatologists is essential for improving clinical prognosis. Preventive strategies remain equally important. Vaccination, adequate prenatal supervision, timely respiratory assessment, thrombosis prevention, nutritional support, and evidence-based therapeutic interventions significantly reduce maternal morbidity and adverse pregnancy outcomes.

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