

The Effects of Pregnancy on Women with COVID-19: Maternal and Infant Outcomes

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Outbreaks of new and emerging viral diseases have always caused anxiety among persons and societies at risk for infection. In particular, this has been especially true for pregnant women, who fear not only for themselves but often even more so for their unborn infants. Pregnant women, their fetuses and infants are generally the most vulnerable members of society during an infectious disease outbreak. The normal physiological, anatomical and immunological changes that accompany pregnancy may increase a pregnant woman's susceptibility to newly emergent viral pathogen as well as increase the severity of infection. These changes, including an adaptive immune state including local suppression of cell-mediated immunity, changes in the maternal cardiovascular and respiratory systems including increased oxygen consumption, heart rate, stroke volume, decreased lung capacity and other physiological changes, may increase the likelihood for severe maternal disease from an infectious disease, and especially with those that have respiratory transmission [1,2]. Recent history is replete with examples of new and reemergent viral diseases that have adversely affected pregnant women, often causing greater harm to them as a result of their condition than among infected but non-pregnant women. Such infectious diseases as influenza, Ebola virus, hepatitis E and varicella may have a more severe clinical course, increased complication rate, and higher case-fatality rate among pregnant women than in non-pregnant individuals.

The impact of emerging infections on the embryo or fetus is difficult to predict and varies depending on such factors as the agent, gestational timing of infection, and such host factors as the maternal-fetal interface. During the recent Ebola virus epidemics non-vaccinated pregnant women were especially prone to excess morbidity and mortality, and the effects on their unborn infants were worse – only 2 newborns having the infection survived [3]. In contrast, some pregnant women might be asymptomatic or have only mild or nonspecific symptoms from an infectious disease, resulting in their escaping detection as having infection even when the embryo or fetus is severely affected. During the Zika virus pandemic, infected pregnant women were typically asymptomatic, or at most had mild symptoms, which were un concerning. However, the virus stealthily crossed the placenta without even inducing an inflammatory response, to produce a tragic spectrum of fetal malformations, neurological injuries, and even death [4].

An important aspect of the current COVID-19 pandemic is its effect on pregnant women and their infants. There have now been numerous publications addressing the adverse effects of COVID-19 on pregnant women, as well as examining the infection status and clinical characteristics of their newborn infants [5-8]. However, there have been no data available to determine whether pregnancy itself has any consequences on the health of reproductive aged women with COVID-19. In order to investigate this important question, Li et al. [9] evaluated for the first time the effects of being pregnant on COVID-19 disease and pneumonia using a case-control experimental design conducted at the Maternal and Child Health Hospital of Hubei Province, a 1900-bed tertiary medical center in Wuhan, China. To accomplish this, the authors enrolled two cohorts of pregnant women with COVID-19 and pneumonia – one consisting of 16 pregnant women with pneumonia and rt-PCR confirmed SARS-CoV-2 infection, and the other with 18 pregnant women with pneumonia who were clinically and radiologically suspected of having COVID-19 but had negative rt-PCR test results. These 34 pregnant women with confirmed or suspected COVID-19 pneumonia were compared with two cohorts of control cases. The first control cohort consisted of 29 non-pregnant women who were also infected with SARS-CoV-2 – this group included 11 non-pregnant women with rt-PCR confirmed

infection and 18 non-pregnant women with clinical and radiographic evidence of the disease but who had negative rt-PCR testing. The second control cohort consisted of two groups of randomly selected women of reproductive age from different time periods with no pneumonia and not having COVID-19 - 121 women in each group - for a total of 242 women.

Their results showed that COVID-19 typically caused mild respiratory symptoms in pregnant women, most of whom were asymptomatic upon hospital admission. When compared with non-pregnant women with COVID-19 pneumonia, the infected pregnant women generally had absent or mild respiratory symptoms, and none developed severe respiratory compromise or required intensive care. Among their findings was a higher incidence of premature delivery in pregnant women with confirmed COVID-19, although this was not the result of severe maternal respiratory disease. In analyzing the neonatal outcomes from the cohort of pregnant women with COVID-19, there was no evidence for intrauterine transmission of SARS-CoV-2. This latter observation was similar to a multitude of studies of pregnant women with COVID-19 and their infants from China (5-8) and is typical of intrauterine maternal-fetal transmission patterns of other respiratory RNA viruses [10]. This important case-control investigation by Li et al. significantly expands our knowledge of the effects of pregnancy and COVID-19 infection and the infection status of neonates from infected mothers.

The clinical outcomes of pregnant women with COVID-19 from Wuhan, China discussed in this article were all favorable, and are similar to reports of all (but one) pregnant women from that country. However, this should not be understood to indicate that infection with SARS-CoV-2 is not capable of causing severe and even life-threatening disease among pregnant women. In the single case of an obstetric near-miss event reported from China, a woman who developed severe pneumonia from COVID-19 at 34 weeks gestation delivered a stillborn infant, had deterioration of cardiopulmonary status and subsequently developed multiple organ system dysfunction syndrome requiring extracorporeal membrane oxygenation [11]. In countries outside of China there are increasing reports of poor clinical outcomes arising from COVID-19 disease among pregnant women. In New York City 2 pregnant women who were initially thought to be uninfected with SARS-CoV-2 developed severe postpartum medical complications requiring admission to intensive care and were found to have COVID-19 [12]. A study of 43 pregnant women with COVID-19 presenting to 2 New York City hospitals, 4 (9.3%) women developed severe disease, and 2 (4.7%) had critical disease requiring intensive case treatment [7]. Cardiomyopathy occurring in pregnant women with SARS-CoV-2 infection has also been described [13]. COVID-19 is now recognized to cause the death of pregnant women. There have recently been 8 cases of mortality among pregnant women from Iran reported [14,15], none of whom had preexisting comorbid conditions that were above the baseline population risk.

In response to the increasing seriousness of COVID-19 as a threat to maternal and infant health, national registries of pregnant women with COVID-19 have been established in many parts of the world – these include the PRIORITY Study in the United States, UKSS Registry in Great Britain, nethOSS in Netherlands, ItOSS in Italy, CHOPAN in Australia, and others. Data obtained from these registries will be of immense significance in further understanding the effects of SARS-CoV-2 infection during pregnancy and its effects on clinical outcomes of mothers and their infants.

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