Pregnancy and COVID-19

Physiological Reviews . VOL 101 : 303-318 . September 24, 2020

Impact factor : 25.588

Professor: Dr. Tavoli

Presenter: Sarina Habibi

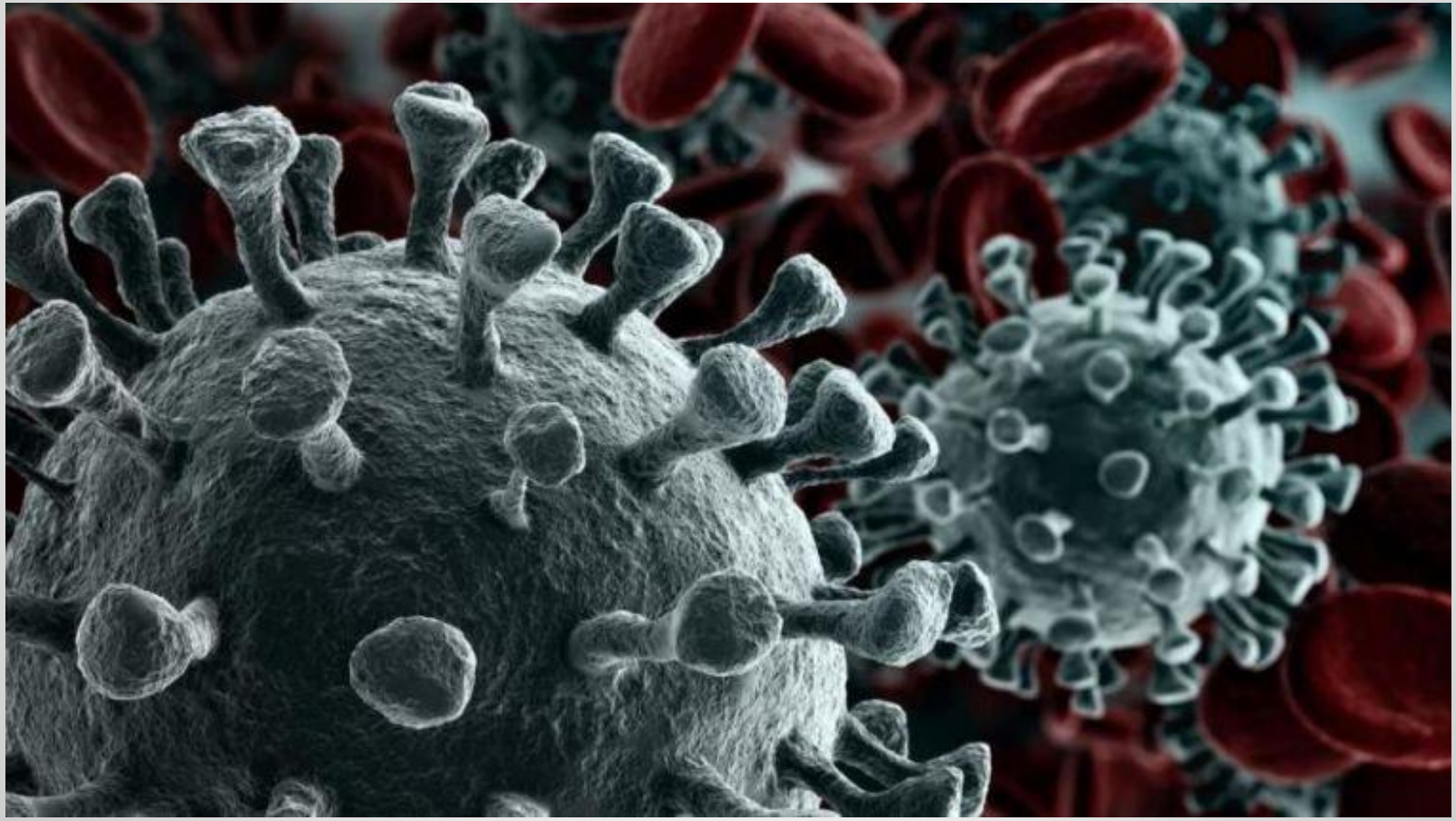
Method

- Search terms : combinations of coronavirus, 2019-nCoV , COVID-19, SARS-COV-2 and pregnancy
- Databases : Medline, Embase, Cochrane, Web of Science, and Cinahl.
- Non-English articles are not included.
- Number of articles reviewed : 34 (until August 17, 2020)

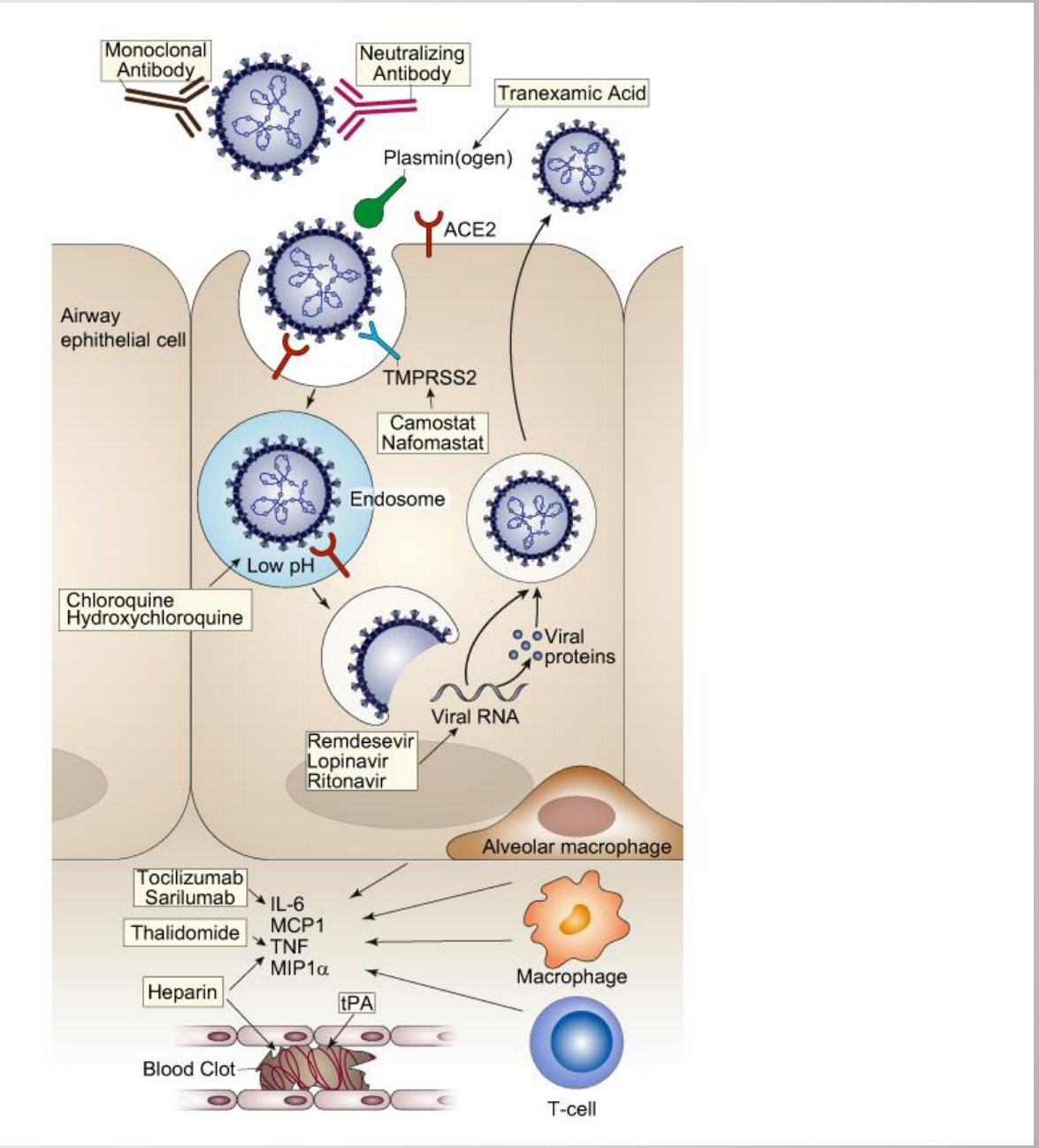
Physiological Adaptations to Pregnancy and the Implications for COVID-19

- Immunological Response
- Respiratory Response
- Coagulation Response
- Endothelial Cell Function
- Placental Response and Mechanisms of Vertical Transmission

Immunological Response



Pathophysiology and Molecular Mechanisms of COVID-19



Modulations of the maternal immune system in pregnancy may affect the response to infection

- Th2 (humoral response)↑ , Th1 (cellular immune response)↓
- Circulating NK cells (innate immune system's viral clearance)↓
- Plasmacytoid Dendritic Cells (pDCs: interferon production)↓
- Circulating progesterone levels↑: repair of lung damage↑, virus-specific antibody↓
- Alterations in the innate immune system including TLRs: unknown effect

Respiratory Response

The reduction in total lung capacity and inability to clear secretions can make pregnant women more susceptible to severe respiratory infections.

Coagulation Response

- High rates of thromboembolic complications in COVID-19

  In a study of 184 critically unwell patients (24%female), 31% had thrombotic events.

- Pregnancy is a hypercoagulable state (additive or synergistic risk factor) due to Increased thrombin production and increased intravascular inflammation.

  A case report describes mortality in a COVID-19+ pregnant woman with GA of 29 wk due to a large pulmonary embolism and basilar artery embolism.

Guidelines recommend:

Thromboprophylaxis in all pregnant women with confirmed COVID-19 until 10 days postnatal

Low threshold for investigation of possible thromboembolism in these patients.

Endothelial Cell Function

- Endothelial cells are surrounded by mural cells (pericytes), they limit inflammation by restricting immune cell entry and prevent coagulation via expression of anticoagulant factors.

  In ARDS, this endothelial barrier is damaged, leading to edema, excessive inflammation, and hypercoagulability.

- COVID-19 risk factors (age, obesity, DM, and cardiovascular disease) are all associated with endothelial cell dysfunction.

- Maternal blood volume ↑, Heart rate ↑, Stroke volume ↑:
  Cardiac output ↑ : Vascular resistance ↓

  The impact of this vasodilation on pulmonary endothelial cell function (immune cell adhesion and activation of coagulation) is not clear.

- Women with preeclampsia have an insufficient decrease in vascular resistance in middle to late gestation and associated endothelial dysfunction.

  An early systematic review found higher rates of preeclampsia in pregnant women hospitalized with COVID-19.

Placental Responses and Mechanisms of Vertical Transmission

- The presence of the virus on the placental surface does not necessarily indicate placental infection.
- Viral infection of the placental cells does not necessarily mean that there is transmission to the fetus.
- Fetal infection does not always mean fetal damage.

- Significant neonatal respiratory diseases appear to be rare, even in the presence of SARS-COV-2 positivity.
- PCR test does not show where does the infection occur.
- Antibody tests show that vertical transmission is possible.

- Although all the infants in reports so far have been asymptomatic and tested negative for SARS-COV-2 viral RNA at birth.

- SARS-COV-2 viral RNA has been detected in the amniotic fluid in case reports of serious maternal disease, although neonatal positivity at birth was variable.

Effects of Covid-19 on pregnancy

- Early pregnancy
- Late pregnancy
- Low and middle income countries
- Corticosteroid use

Postpartum effects of Covid-19

- Effects on the neonate
- Effects on breastfeeding
- Unintentional effects of the disease on women health

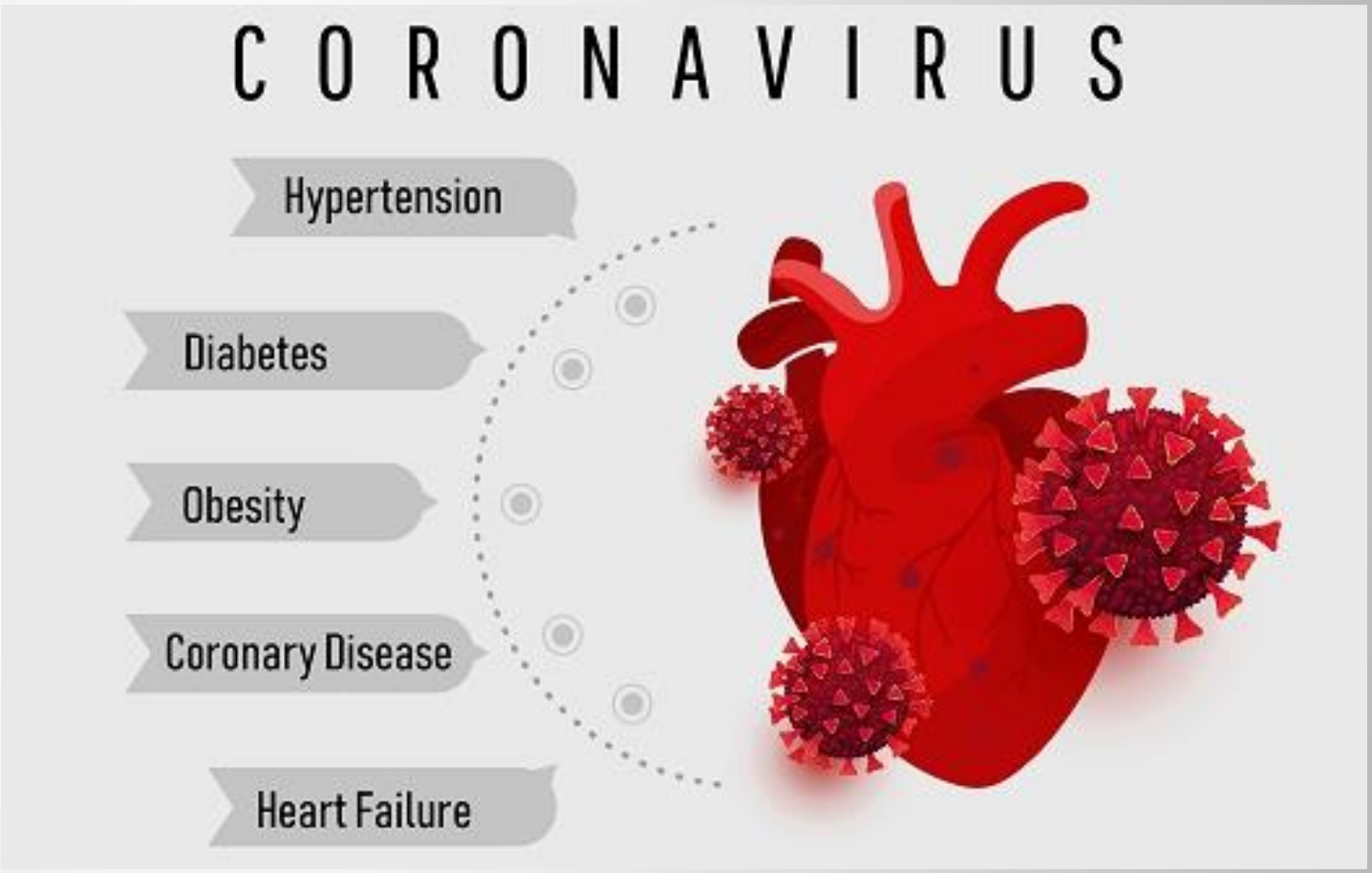
Conclusion & Future

- It is too early to reach a decisive conclusion
- Most pregnant women seem to catch a mild form of the disease
- Testing is far from universal therefore the iceberg problem
- Neonate conclusion is not definite
- The need for future research in this field is warranted

Clinical Highlights

1. The risk of severe COVID-19 during pregnancy may be higher than in the general population.

2. The risk factors for severe COVID-19 are similar in pregnancy to the general population.



3. Vertical transmission is plausible, but mechanisms are uncertain. Severe neonatal disease appears to be rare.

4. Antenatal corticosteroid use for threatened preterm birth is likely to be safe for the mother, and corticosteroid use for severe maternal disease may be beneficial.

5. Clinicians should have a low threshold for thromboprophylaxis in mothers with COVID-19, and for investigation of possible thromboembolic events.

6. Mothers with COVID-19 should be encouraged to breastfeed if they are able, but should wear personal protective equipment to do so.

7. Asymptomatic COVID-19 in pregnancy appears to be common but is of uncertain clinical significance.

8. Clinicians should be mindful of the wider implications of the pandemic and ensure that screening takes place for mental health distress and intimate partner violence whenever possible.