COVID-19 AND PREGNANCY

REVIEW OF CURRENT EVIDENCE
&
GUIDELINES FOR REPRODUCTIVE HEALTH WORKERS



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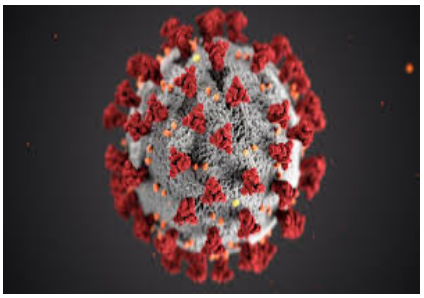
GUIDELINES TO HEALTH WORKERS



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ABSTRACT

Since early December 2019, the Coronavirus Disease-19 (COVID-19) infection, which started in China, has spread across the globe and has become a global health threat. Whereas all individuals are at risk of contracting COVID-19, some are at a greater risk because of pre-existing comorbidities or their biological statuses. Due to changes in their bodies and immune systems, pregnant women are considered to be particular susceptible to COVID-19. Evidence so far indicates that pregnant women do not appear more likely to contract the COVID-19 infection than the general population and their neonates do well generally.

Data continues to accumulate on the impact of COVID-19 disease on pregnant women, their fetuses and newborns. With the expansion of community transmission of COVID-19 within countries, the number of affected pregnant women will increase globally, and so too may be the related complications on both the mother and her foetus/newborn.

The COVID-19 pandemic has profoundly altered the status of everyday life across the world. It has and will continue to impact on our reproductive health care delivery in the face of resource-constraints. There have been a number of guidelines by various bodies on health care provision in the era of COVID-19. It is in the same line that our College (ECSACOG), as one ofits obligation to its members as and one of its core activities has produced this guidance to its members on how best to provide quality, evidence-based care to mothers and their unborn children in the current pandemic. .

INTRODUCTION

According to the World Health Organization (WHO), epidemic viral diseases continue to emerge and represent serious concerns to public health. In the last two decades, there'sbeen a number ofthem, such as the severe acute respiratory syndrome Coronavirus (SARS-CoV) in 2002 to 2003, H1N1 influenza in 2009, the Middle East respiratory syndrome Coronavirus (MERS-CoV), first identified in Saudi Arabia in 2012**(1,2,3).**

Towards the end of 2019, a new acute viral respiratory illness emerged in Wuhan China, referred to as "pneumonia of unknown etiology". Subsequent viral isolation from human patients and molecular analysis showed that the pathogen was a new coronavirus, first named 2019nCoV, and subsequently renamed by WHO as Corona virus-2019 (COVID-19)**(4).**The World Health Organisation (WHO) declared the disease a Public Health Emergency of International Concern at the end of January 2020**(5).** Following several reports on the spread and effects of COVID-19, the WHO raised the threat to the epidemic to the "very high" level, on February 28, 2020, and a pandemic on March 11, 2020**(6).**

The epidemiology, pathophysiology, clinical manifestations, immediate, medium-term and long term complications of the infection are still evolving. There are serious concerns regarding the potential effects ofCOVID-19 disease on pregnant women, their fetuses and newborns. The number of published reports on COVID-19 in pregnancy is increasing with more evidence becoming available. There are still a number of unanswered questions.Pregnant women are considered to be at increased the risk of respiratory viral infections including COVID-19, due to bodily and immunological changes in pregnancy.

There have been reports of a few cases of pregnant women with COVID-19 infection in

Africa, some with severe disease but these have not appeared on published literature. It is possible there are other either asymptomatic or symptomatic cases who have gone unnoticed and therefore unreported. As the number of infected individuals increase, so too will the number of pregnant women with COVID-19 infection. It is imperative therefore that reproductive health workers and health facilities especially in SSA with related constrains in requisite health care and other relevant resource availability are not only aware thereof but are also proactive in providing quality, nondiscriminatory requisite health care to all pregnant mothers and their unborn children.

THE VIRUS

Coronaviruses are a large family of viruses. Examples are the Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV **(7, 8).** They are a class of genetically diverse viruses found in a wide range of host species, including birds and mammals. They are non-segmented positive-sense RNA genome viruses surrounded by an envelope and cause respiratory and gastrointestinal infections in humans and animals **(9).** COVID-19 is the seventh member of the *Coronavirinae* known to infect humans **(10).**

Full-genome sequencing and phylogenic analysis indicate it is a betacoronavirus in the same subgenus as the severe acute respiratory syndrome (SARS) virus (as well as several bat corona viruses) (80%) and MERS-CoV (50%), that infects humans, bats, and wild animals but in a different clade (**11,12).** The structure of the receptor-binding gene region is very similar to that of the SARS Coronavirus. The virus has been shown to use the same receptor, the angiotensin-converting enzyme 2 (ACE2), for cell entry **(10,13).** The Coronavirus Study Group of the International Committee on Taxonomy of Viruses has proposed that this virus be designated severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2)**(14,15)** and the World Health Organisation (WHO) has classified it COVID-19 **(16).**

Two different types of SARS-CoV-2 were identified in China, designated type L (accounting for 70 percent of the strains) and type S (accounting for 30 percent) **(17).** The L type predominated during the early days of the epidemic in China, but accounted for a lower proportion of strains outside of Wuhan than in Wuhan. The clinical implications of these findings are uncertain.

EPIDEMIOLOGY

Since the first reports of cases from Wuhan, a city in the Hubei Province of China, at the end of 2019, COVID-19 has spread to all continents, except for Antarctica. It was thought to have originated from food wholesale markets, the first phase being characterized by spread from wild animals in a wet market to humans**.** The subsequent spread to other parts of China and other countries has been through human-human transmission either within hospitals (nosocomial infection) or by family transmission (close-contact transmission). The human-human transmission of COVID-19 is through respiratory droplets, physical contact and aerosols **(18,19).** Virus released in the respiratory secretions when a person with infection coughs, sneezes, or talks can infect another person who is in close proximity and for prolonged periods, (at least 15 minutes at a distance of less than 6 feet), if it makes direct contact with the mucous membranes. Infection can also occur if a person touches an

infected surface and then touches his or her eyes, nose, or mouth. Droplets typically do not travel more than six feet (about two meters). **(18, 20-27).**

SARS-CoV-2 has been detected in non-respiratory sites/specimens, including stool, blood, ocular secretions, and semen **(28-33),** but the role of these sites in transmission is uncertain**.** Several reports have described detection of SARS-CoV-2 RNA from stool specimens, even after viral RNA is no longer be detectable from the upper respiratory specimens **(31,32).** Live virus has been cultured from stool **(29,34).** Foecal-oral transmission ofCOVID-19 is yet to be documented and according to a joint WHO-China report, it does not appear to be a significant factor in the spread of the infection **(35).** COVID-19 patients can shed the virus in faeces for days after all respiratory symptoms have disappeared **(36),** The virus RNA has also been found in sewage **(37,38)**. Angiotensin-converting enzyme ACE2 is used by the virus as a receptor to enter human cells **(15)** and ACE2 messenger RNA is highly expressed in the gastrointestinal system **(39),** hence the GI symptoms and finding of the virus in stool or anal swabs is not completely unexpected. If confirmed, faceal-oral transmission could have far-reaching epidemiological consequences, for public health and for pandemic control strategies.

Detection of SARS-CoV-2 RNA in blood has also been reported in some but not all studies that have tested for it **(28,29).** However, the likelihood of blood borne transmission (eg, through blood products or needle sticks) appears low; respiratory viruses are generally not transmitted through the blood borne route, and there have not been any reports of transfusion-transmitted or needle stick infection for SARS-CoV-2.

The risk of contracting the virus depends on the type and duration of exposure, proximity and duration thereof, or non-use of preventive measures, severity of the infection especially the amount of viruses in the respiratory secretions of the patient. Infected individuals are more likely to be infectious in the earlier stages of infection as the COVID -19 viral RNA levels from upper respiratory specimens appear to be higher soon after symptom onset compared with later in the illness **(40-44)**]. The risk of transmission with more indirect contact (eg, passing someone with infection on the street, handling items that were previously handled by someone with infection) is not well established. It's possibly low **(23,45-47).** Transmission of SARS-CoV-2 from asymptomatic individuals (or individuals within the incubation period) has also been well-documented **(48-54).** However, the extent to which asymptomatic or presymptomatic transmission occurs and how much it contributes to the ongoing pandemic remain unknown.

Contaminated surfaces, critical in the homes and hospitals, may be another source of infection if susceptible individuals touch them and then transfer infectious virus to mucous membranes in the mouth, eyes, or nose **(23,55).** The frequency and relative importance of this type of transmission remain unclear. Persistence of human coronaviruses on surfaces is highly variable (from 2 hours to 9 days), depending on temperature, humidity, type of surface and virus strain. A recent article by Kampf et al. (2020), found persistence of viral genomes of coronaviruses up to 9 days on metal, glass and plastic surfaces at room temperature **(45).** SARS-CoV-2 was detected on surfaces 72 hours after application and in aerosol particles after 1 hour **(22).**

The incubation period is said to vary from 2 to 14 days, with most infected individuals becoming symptomatic within 5 days after exposure **(18,56,57)**. It is uncertain how long a

person remains infectious thereafter. The duration of viral RNA shedding is variable; with a wide range, depending on among other things the severity of illness **(43,44).**

The issue of immunity to and/or after COVID-19 infection is a topical subject. Earlier reports suggested that BCG vaccination appeared to protect vaccinated individuals from COVID19 but this has been disproved**.**There are reports indicating that individuals with allergic conditions e.g. asthma may be spared from COVID-19. Preliminary evidence suggests that some of the acquired antibodies after an infection are protective **(41,43,58**), but this remains to be definitively determined. Moreover, it is unknown whether all infected individuals mount a protective immune response and how long any such protective effect might last. Data on protective immunity following COVID-19 are emerging, as more work is been done

PATHOPHYSIOLOGY

There are still knowledge gaps in the pathogenesis of COVID-19, and scientists are working to fill in the gaps. There has been no discernible evidence on the minimum infectious viral load for COVID-19 pandemic, but many researchers speculate that a few hundreds of SARS-CoV-2 virus would be enough to cause the disease among susceptible hosts. Guidelines from Chinese health authorities described three main transmission routes for the COVID-19:

- **droplets transmission,**
- **contact transmission, and**
- **aerosol transmission.**

- Droplets transmission was reported to occur when respiratory droplets (as produced when an infected person coughs or sneezes), are ingested or inhaled by individuals nearby in close proximity;
- Contact transmission may occur when a subject touches a surface or object contaminated with the virus and subsequently touch their mouth, nose, or eyes; and
- Aerosol transmission may occur when respiratory droplets mix into the air, forming aerosols, and may cause infection when inhaled high dose in a relatively closed environment **(19,59).** In addition to these three routes, the digestive system has been cited as a potential transmission route for COVID-19 infection**(60).**

The inhaled COVID-19 virus likely binds to epithelial cells in the nasal cavity and starts replicating. Virological assessment of infected individuals with COVID-19 shows that SARS-CoV-2 replicates in both upper and lower respiratory tracts **(43)**. It then propagates and migrates down the respiratory tract along the conducting airways where the ciliated cells are the primary cells infected. ACE-2 is the main receptor for COVID-19. This is widely expressed in human tissues, including human airway epithelia, lung parenchyma, vascular endothelia, kidney cells and small intestinal cells **(39,61,62,63).** The pathological result of COVID-19 is a diffuse alveolar damage with fibrin-rich hyaline membranes and a few multinucleated giant cells **(64).**

The presence of ACE-2 in other sites on top of the airway and lungs such as heart, intestinal epithelium, vascular endothelium, and the kidneys **(51),** explains the multi-organ injuries seen in COVD-19 disease. SARS-CoV-2 seems to not only gain initial entry through

ACE2, but also to subsequently down-regulate ACE2 expression, resulting in reduced conversion of angiotensin II (Ang-II) to angiotensin 17 (Ang-17). Ang-17 physiologically mediates protective cardiovascular effects in target organs **(65,66).**

The clinical course is mediated through an inflammatory response, endothelial dysfunction and microvascular damage **(67).** Inflammatory cell infiltration has been reported in the alveoli of patients with acute respiratory distress syndrome associated with SARSCoV-2 infection,**(64).** Endothelial dysfunction, cytokine storm, oxidative stress, and Ang-II upregulation may explain the coagulopathy frequently seen in severe Coronavirus disease **(68).**.This can be at the origin of coagulopathy and haemostasis activation that lead to thrombotic disorders observed in Covid-19 patients**.** There have been numerous reports of embolic disorders affecting various organs/parts of the body such as the lungs, abdominal viscera, leading to infarction thereof, the heart, the CNS leading to stroke **(69-72).** Lymphopenia is present in more than 80% of Covid-19 patients and could predict disease severity of Covid-19 (**73).** There may be other haematological derangements such as thrombocytopenia **(74).** There is an increase in troponin, which is a marker of disease severity. This is said to predict future cardiovascular events such as myocardial injury seen COVID-19 **(75).** It is associated with an increase in D-dimer. Approximately one-half of patients with COVID-19 present high levels of D-dimer which may be due to intense inflammation stimulating intrinsic fibrinolysis in the lungs with spillover into the bloodstream. It is associated with disease severity and higher mortality **(76,77).** Another factor that may contribute to microangiopathy is vasculitis **(78).** ACE2 is highly expressed in pericytes of adult human hearts, which indicates an intrinsic susceptibility of the heart to SARS-CoV-2 infection **(79).** It has been suggested that, in patients with COVID-19, microvascular damage occurring in the heart causes perfusion defects, vessel hyper permeability, and vasospasm, leading to myocardial injury **(80,81).**

Chest pain, which has been broadly reported as a symptom of COVID-19, is also associated with cardiac injury **(82),** but it has a very low specificity, owing to the primary lung disease (i.e. pleuritic pain). In about 50% of COVID-19 cases, the presence of SARSCoV-2in faecal samples and detection of SARS-CoV-2 in intestinal mucosa of infected patients suggest that enteric symptoms could be due to invasion of ACE-2-expressing entrerocytes and the GI tract may be an alternative route of infection. In over half of the patients, faceal samples remained positive for SARSCoV2RNA for a mean of 11 days after clearance of respiratory tract samples **(83).**

A considerable proportion of critically ill patients with COVID-19 present with acute kidney injury. The mechanism may be the same, with microangiopathy of renal vessels. Worsening of troponin clearance in patients with acute kidney injury could also contribute to the elevated levels in those patients. The acute kidney injury is associated with worse prognosis **(84, 85)**

CoV-2 is capable of causing ocular complications such as viral conjunctivitis in the middle phase of illness. RT-PCR assay demonstrated the presence of viral RNA in conjunctival specimen 13 days after onset, and conjunctival swab specimens remained positive for SARS-CoV-2 on 14 and 17 days after onset **(86,87)**.

With regard to disease progression, there are three main categories.

- The asymptomatic or mild cases that usually recover comprise about 81%,

- ❖ Severe cases who form about 14%, that develop severe disease, and
- ❖ Critical ones (5%) who develop multi-organ failure, primarily respiratory failure, renal failure, cardiac complications, stroke, etc) requiring intensive care unit (ICU) admission and a few de as a result **(76,88-90).**

CLINICAL MANIFESTATIONS

The clinical presentation varies from one patient to another. The main symptoms do not distinguish COVID-19 from the other viral respiratory infection. The major reported symptoms include fever, sore throat, dry cough, dyspnoea, chest pains, fatigue, anorexia, anosmia, dysgeusia, vomiting, abdominal pains, diarrhoea, generalized body pains, severe headaches and dizziness. Others include rhinorrhoea, conjunctivitis, dermatological (urticarial, vesicular, maculopapular rash), confusional states, delirium, conjunctivitis, and the so-called "covid-toes" **(57,91-98).** Of special note is the fact that patients may present with some of the symptoms only to develop others later. Fever is reportedly the commonest symptom among the mild to moderate disease, but it's not always present or high **(101,102).** Some persons with COVID-19 have experienced gastrointestinal symptoms such as diarrhea and nausea prior to developing fever and lower respiratory tract signs and symptoms **(103).** Anosmia or ageusia preceding the onset of respiratory symptoms has been anecdotally reported (**104).**

CLINICALSYMPTOMATOLOGY IN COVID-19 DISEASE

The signs and symptoms of COVID-19 present at illness onset vary, but over the course of the disease, most persons with COVID-19 will experience the following[1,4-9]:

- Fever (83–99%)
- Cough (59–82%)
- Fatigue (44–70%)
- Anorexia (40–84%)
- Shortness of breath (31–40%)
- Sputum production (28–33%)
- Myalgia (11–35%)

Early symptoms reported by some people include fatigue, headache, sore throat or fever. Some people experience a loss of smell or taste. Symptoms can be mild at first, and in some people, only to become more intense over five to seven days, with cough and shortness of breath worsening if pneumonia develops. The type and severity of the first symptoms can vary widely from person to person.

Older adults and persons with medical comorbidities may have delayed presentation of fever and respiratory symptoms **(105,106).** Headache, confusion, rhinorrhea, sore throat, hemoptysis, vomiting, and diarrhea have been reported but are less common (<10%) **(57,91-93**

With regards to disease clinical progression among patients who developed severe disease, the medium time to dyspnea ranged from 5 to 8 days, the median time to acute respiratory distress syndrome (ARDS) ranged from 8 to 12 days, and the median time to ICU admission ranged from 10 to 12 days **(91,92,105,106).** Clinicians should be aware

of the potential for some patients to deteriorate rapidly one week after onset of the illness. Mortality among patients admitted to the ICU ranges from 39% to 72% depending on the study **(91,105-107).** The median length of hospitalization among survivors is reported to be 10 to 13 days **(57,91,107).**

HUMAN PREGNANCY

Human pregnancy is a physiological process, often a time of great joy and expectation for most women and their families. Pregnancy induces numerous bodily changes in the woman, necessary for the embryo and fetus to have a normal growth, and for the woman to go through the pregnancy safely **(125)**. Whereas most women go through pregnancy with little or no ill-health effects, a few sustain short-term or long-term complications and even death. Not all changes are noticeable. Some of the major changes in the woman's body relevant in the context of viral infections such as SARS-CoV-2, include:

1) Pulmonary changes

There are profound changes in the respiratory system because of maternal adaptation during pregnancy **(108-116).**

- Understanding the anatomical and physiological alterations is essential for proper management of associated respiratory pathologies during pregnancy **(109).** Elevated oestrogen levels cause hyperaemia, hyper-secretion and oedema within the mucosa leading to nasal congestion, especially in the third trimester **(110).** Progesterone can cause chemoreceptor resetting resulting in a slight increase in PO_2 and a consequent decrease in PCO_2, which may cause a state of compensated respiratory alkalosis **(111).**
- The progressive increase in the size of the foetus and enlargement of the uterus, with advancing gestation, constitutes a mechanical impediment to the normal process of maternal ventilation. There is about 4 cm cephalad displacement of the diaphragm with a compensatory increase in the transverse and antero-posterior diameters of the chest **(112,113)**.
- Oxygen consumption and basal metabolic rate increase (by up to 21% and 14%, respectively), but to a lesser extent than ventilatory augmentation **(114,115).** There is lower oxygen reserve of the mother.
- Dyspnoea or breathlessness is common in pregnancy, in 70%, of healthy pregnant women during their daily living activities, starting from first trimester. Pregnancy-induced hyperventilation is the result of complex interactions between changes in chemo-reflex drives, acid–base balance, metabolic rate and cerebral blood flow **(114,116).** This makes distinguishing between physiological and pathophysiological origins of dyspnea a challenge for health care workers

2) Cardiovascular changes

There are significant cardiovascular alterations during pregnancy **(117-121)**

i. The cardiac output increases by about 40-50% during the third trimester there is a 50% raised cardiac flow because of increased systolic flow and

cardiac frequency. The blood volume is about 40% larger than in non-pregnant woman, as result of increase in the plasma volume (50%), and red cells mass (30%) **(117,119-121).**

ii. Arterial pressure remains unchanged throughout the pregnancy, or sometimes gently decreases (10%). Increase of cerebral blood flow (as a consequence of a raised cardiac flow) is limited by the cerebral auto regulation**(117)**

iii. Maternal pushing efforts in the second stage of labor can increase cardiac output by as much as 50 %.**(122)**

v. Pressure on the inferior vena cava by the enlarging pregnant uterus increases peripheral venous pressure and possibly slows down blood flow in the limbs resulting in a decreased venous return to the heart. This may lead to dyspnoea on exertion, leg edema, This may lead to venous thrombosis in the lower limbs in late pregnancy in some cases**(120)**

vi. Maternal heart rate increases**, (123)**.

vii. Vascular Resistance mirrors that of the decline in systolic and diastolic blood pressures **(124)**

3) Haematological Changes

i. During pregnancy there is an increase in coagulation and reduced fibrinolysis, to prevent a haemorrhage especially at delivery **(117).** While these physiological changes may be important for minimizing blood loss, they lead to an increased risk of thromboembolism during pregnancy and the post-partum period. There are increases in a number of clotting factors (I, II, VII, VIII, IX and XII), a decrease in protein S levels and inhibition of fibrinolysis. As gestation progresses, there is also a significant fall in the activity of activated protein C, an important anticoagulant. **(117,125,126).**

4) Renal Changes

The functional impact of pregnancy on kidney physiology is widespread, involving practically all aspects of kidney function. The glomerular filtration rate increases 50%. The kidneys increase in length and volume, and physiological hydronephrosis occurs in up to 80% of women**.** Ureteric compression by the enlarging uterus may cause urinary stasis, which if prolonged and severe may contribute, or worsen the hydronephrosis **(127).**

5) Immunological Changes

The maternal immune system engages in a fine balancing act, maintaining tolerance to the fetal allograft while preserving innate and adaptive immune mechanisms for protection against microbial challenges. These alterations include changes in local immune responses, that is, in the uterine mucosa (decidua), as well as changes in peripheral immune responses. This change is involved in the pathogenesis of preterm birth and other pregnancy-related complications such as infections **(128-132).**

COVID-19 AND PREGNANCY

The impact of COVID-19 disease on the pregnant woman, her unborn and newborn baby is of particular interest to obstetricians, pediatricians, patients as well as their families. Some of the major concerns include whether,

- pregnant women are more susceptible to COVID-19,
- infected pregnant women have poorer outcomes in terms of morbidity and/or mortality compared to non-pregnant women of same ages,
- infected pregnant women have severer disease or
- They have worse maternal-foetal outcomes compared with uninfected pregnant women of similar ages.

Emerging infections, especially viral exert an impact on pregnant women and their fetuses **(133).** Published literature from previous viral diseases showed significant maternal and foetal/neonatal adverse outcomes.

- The 1918 influenza pandemic caused a mortality rate of 2.6% in the overall population, but 37% among pregnant women **(134).**

- Pregnant women infected with H1N1 (2009) influenza virus were at increased risk of hospitalization and severe acute respiratory distress syndrome (ARDS), which was associated with high mortality and their newborns had an increased risk of pre-term birth or low birth weight **(135).**

- Approximately 50% of pregnant women who developed SARS-CoV in Hong Kong, in 2003, required admission to intensive care units, about 33% required mechanical ventilation and the mortality rate amongst them was as high as 25%. It was also associated with a high incidence of maternal morbidities e.g. renal failure, and disseminated intravascular coagulopathy and foetal/neonatal complications, such as spontaneous miscarriage, (57 % who presented during the first trimester), 80 % of those presenting late in pregnancy had preterm deliveries. Over 80 % of the women gave birth via emergency cesarean secondary to failure at maintain adequate blood oxygen saturation, despite being on 100 % oxygen. Other neonatal effects included intrauterine growth restriction, use of endotracheal intubation, admission to neonatal intensive care unit **(136,137).** Among the 12 gravid women with SARS in Hong Kong, in 2003, 50 % required ICU admission, 33 % required mechanical ventilation, 57 % who presented during the first trimester had spontaneous miscarriages, and 80 % of those presenting late in pregnancy underwent preterm deliveries. Over 80 % of the women gave birth via emergency cesarean secondary to failure at maintain adequate blood oxygen saturation, despite being on 100 % oxygen **(136)**.

- Data on the effects of MERS-CoV on pregnancy is limited. Middle East Respiratory Syndrome Coronavirus (MERS-CoV) causes severe acute respiratory illness associated with a high risk of mortality amongst infected individuals. A few published reports on its impact on pregnancy showed varied outcomes from very good to mortalities. Wong et al (2004) showed that 63.6% of patients with MERS-CoV required intensive care unit admission **(136).** Others reports indicated a high fetal demise rate (30%) among pregnant women with MERS-CoV **(137,138),** high caesarean section rates (40%) and case fatality rate

of about, (35%) which was statistically comparable to the overall MERS case fatality rate **(139).** Alserehi et al (2016) report good outcome for both mother and newborn despite severe disease in the mother requiring ICU admission. The patient was also a nurse in the same hospital, who had contracted the infection in her second trimester from a patient **(14).** Likewise Jeong et al (2017), reported a case in Korea with MERS-CoV infection during pregnancy. The case showed relatively benign maternal course which resulted in full recovery with subsequent healthy full-term delivery without MERS-CoV transmission **(141).**

Information regarding the epidemiology, clinical features and effects of COVID-19 disease in pregnancy remains scarce, basically because it is a novel viral infection and many of its aspects are still unfolding and being reported. The number of infected, both asymptomatic and symptomatic, pregnant women is steadily increasing globally and relevant data is slowly trickling in. There are concerns based on the infectivity of COVID-19 compared to earlier viral infections and reported adverse maternal, foetal/neonatal effects.

The main concerns are whether;

- Pregnant women with COVID-19 disease will develop distinct clinical features from those of non-pregnant adults,
- Those with confirmed COVID-19 infection are more likely to die of the infection
- Have preterm labour,
- COVID-19 spreads vertically and/or poses risks to the fetus and/or neonate.
- There are effects on the fetus in the first or second trimester of pregnancy
- Vaginal delivery the increase the risk of mother-to-child intrapartum transmission and whether uterine contractions could increase the possibility of the viral transmission in case of MTCT,
- COVID-19 disease might damage the placenta, and therefore represents an important link in vertical transmission,
- COVID-19 disease in pregnant women and its effects influence the time or mode of delivery.

Current evidence seems to suggest that the clinical characteristics of patients with COVID-19 during pregnancy are similar to those of non-pregnant adults with COVID-19 **(74),** in contrast to both SARS and MERS. There have however been reports of adverse perinatal outcomes such as increased risks of miscarriages, preeclampsia, preterm birth, and stillbirth.

i) THE FIRST TRIMESTER

There have been concerns that due to high fevers associated with severe COVID-19 disease, there might be an increase in miscarriages. So far, though majority of the reported cases have been in the second and third trimesters, in labour or soon after delivery. There has been no reported case diagnosed in the first 12 weeks of pregnancy.Given the data on SARS **(142-144),** we cannot rule out the risk of miscarriage in women affected by COVID-19. at this stage. Right now, there is no scientific evidence to suggest that Coronavirus increases the risk of miscarriage at any stage of pregnancy, including the first few weeks. There is also no evidence to suggest that the virus affects the baby's development in the

womb.

ii) SECOND AND THIRD TRIMESTERS

Baud et al reported a second trimester miscarriage (at 19 weeks). There was placental infection but the foetus was negative for SARS-CoV-2 **(145).** There has been no report of IUFGR, but of LBW born weighing <2500 gms. There was no indication if this was IUFGR **(106)**. This may be because the numbers have been low and majority of patients so far has been shortly before or after delivery. Women affected by COVID-19 who delivered did so within less than a fortnight from onset of the Illness **(74)** thus, fetal growth is unlikely to developwithin such a short period. There have been reports of premature delivery, some of which were iatrogenic, necessitated by the mothers' and/or foetal conditions, or the attending doctors' concerns and desire to institute treatment on the mother **(146,147).**

iii) DELIVERY

The mode of delivery whether vaginal or caesarean section, have largely been dictated by the foetal condition on the one hand, the maternal condition on the other, and the need/decision by the attending obstetricians to expedite delivery as well as previous or current obstetric circumstances **(146).** At times obstetricians have done caesarean section for the fear of MTCT in the course of vaginal delivery. In the study by Chen et al, (2020) all mothers (n =9), were delivered electively through cesarean section, two at 36 weeks' gestation **(148).** Seven (70%) in the study by Zhu et al. (2020) (n=10), were delivered by cesarean section. Of these 5/9 women (6/10babies) were preterm delivery **(149).** The indication for the mode of delivery was not stated, but six babies had fetal distress prior to delivery, which might be the indication for the mode of delivery. Wang et al (2020) reported one woman who delivered at 30 weeks for fetal distress **(150).** Liu et al. (2020) reported on 13 women, of whom seven delivered preterm through cesarean section **(151).** The indication for mode of delivery was not indicated. Recent data has shown that caesarean section is associated with worse maternal outcome and clinical deterioration compared with vaginal delivery and more neonates required NICU admission**(152).** A collaborative study reported worse pulmonary complications following surgery in COVID-19 positive patients. The study team feels it might be because these patients are vulnerable to lung complications because of related heightened inflammatory and immunosuppressive responses to surgery and mechanical ventilation **(153).**

The WHO advises that caesarean section should only be performed when medically justified, and that the mode of delivery should be individualized and based on a woman's preferences alongside obstetric indications. In case of vaginal delivery, the second stage should be expedited by the use of either ventouse or forceps to ease the cardio-respiratory burden on the mother **(154-157).** Other professionals from the USA and Europe, have expressed the same, because of worse outcomes amongst those delivered by caesarean section**.**

VERTICAL TRANSMISSION

Vertical transmission refers to microorganisms moving from the mother to the fetus before and after through the cord blood, the placenta, the birth canal or through breast-feeding. This has been one of the most sought after answer in the study of COVID-19. The possibility of mother-to-child transmission of the virus is of great concern to the obstetrician, neonatologist, the mother and her immediate family. Whereas published reports to date

indicate that there is little or no evidence for vertical transmission of SARS-CoV-2 **(74,147-149,158-160),** reports of infants delivered by pregnant woman with COVID-19 pneumonia, testing positive on the second day of life have raised concerns that COVID-19 could be contracted in the womb **(74,161).** Niu et al identified SARS CoV-2 in an infant 30 h born by to a mother with confirmed COVID-19 through caesarean section, raising the question of vertical transmission. Amniotic fluid, cord blood, and the placenta were unfortunately not analysed **(162).** Piersigilli et al reported a preterm infant who tested positive day 7 after caesarean section and thought this was a horizontal transmission from the mother to the infant. They concluded though t hat, it is vital to consider all potential modes including horizontal, vertical or congenital transmission, and perinatal or postnatal transmission via aerosol, droplet, and direct contact **(163).** However efforts to identify SARS-CoV-2 in amniotic fluid, vaginal secretions, cord blood, placenta, serum, anal swab, and breast milk have not yielded positive results, suggesting that it's unlikely.

NEONATAL OUTCOME

Evidence from the limited published reports, neonates born of COVID-19 positive mothers do very well generally. There have however been reports of foetal distress in third trimester or in labour, which required urgent delivery including caesarean section. In the study of Chen et al., all (n=9) babies were delivered at 36 weeks' gestation and were well at discharge **(148).** Zhu et al. reported on a cohort delivered at an earlier gestational age (from 31 weeks); 6/10 babies were admitted to the neonatal unit for respiratory support, two developed disseminated intravascular coagulation (DIC) and one had multiple organ failure. Neonatal morbidity was more marked in this series, probably due to greater prematurity. One baby died after being born at 34 weeks. The neonate required admission at 30 min after delivery with respiratory difficulties. **(149).** Wang et al. reported a baby born at 30 weeks in good condition with an uneventful neonatal course **(150).** Liu et al. reported one stillborn and nine liveborn neonates, all of whom had an Apgar score (time unspecified) of 10. In this series, COVID-19 was associated with preterm delivery in 47% of reported cases. All nine live births had a 1-min Apgar score of 8–9 and a 5-min Apgar score of 9–10. Amniotic fluid, cord blood, neonatal throat swab, and breastmilk samples from six patients were tested for SARS-CoV-2, and all samples tested negative for the virus **(151).** Another study enrolled 16 pregnant women with COVID-19 and 45 pregnant women without COVID-19 in their third trimester. The results did not indicate any increased risk of perinatal complications in the SARS-CoV-2 infected women **(161).** The sample sizes in all these studies have been small. Perhaps as the pandemic spreads and we see more pregnant women with confirmed COVID-19 disease, from early in pregnancy, the effects thereof may be clearer.

Whether to breastfeed the neonate or not has been a subject of serious debate and study since the pandemic, mainly cognisant of the possibility of MTCTT. The risk of mother to child transmission by a breastfeeding by mother with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) positive woman is a major cause of major concern especially for developing countries **(73).** Studies have shown that mother milk is safe for feeding the neonate. The main risk factor during breastfeeding is the close contact between the infected mother and her child instead, the mother transmitting the virus to the baby through respiratory droplets **(163).** There have been recommendations to avoid direct breastfeeding and use expressed mother's milk **(164).** In a recent letter, Li et al states 'all infants with suspected COVID-19 should be isolated and monitored regardless of whether or not they

present with symptoms **(165).** Another publication by Chinese researchers do not consider the breast feeding option, nor the use of expressed breast milk for newborn infants **(166).** Favre et al from Switzerland, suggest to avoid direct breast feeding as sucking at the breast presumably might increase the risk of SARS-CoV-2 transmission via aerosol due to the intimate contact during feeds **(164).**

Due to limited scientific evidence about the possibility of SARS-CoV-2 transmission through breast milk and the presence of antibodies in the breast milk, it is strongly suggested encouraging breastfeeding by COVID-19 infected mothers but with following set guidelines **(167).** According to WHO, COVID-19 virus has not been detected in the breast-milk of any mother with confirmed and suspected COVID-19, and there is no evidence so far that the virus is transmitted through breastfeeding **(168).**

PLACENTAL EFFECTS

Cognisant of the centrality of the placental function to foetal/neonatal well-being and therefore outcome, there have been concerns on the possibility of placental injuries in COVID-19 disease. This is because previous reports on viral infections have indicated that they are specific placental changes. These include lymphoplasmacyticvillitis with enlargement of the villi and intravillous hemosiderin deposition in maternal cytomegalovirus infection, and intervillositis in Zika virus and Dengue virus infections **(169-171).**

With regard to the common coronaviruses, there have been some reports of placental pathology in women with SARS-CoV infection. The placentas of three pregnant women with SARS-CoV infection demonstrated increased perivillous or sub chorionic fibrin, while in two there was large zones of avascular villi, and another demonstrated a large villous infarct. However, none of the seven placentas had any acute or chronic inflammatory processes **(172)**. There have not been histopathologic studies of placental changes in MERS infection, but one report describing placental abruption.

Cognisant of the foregoing and the infectivity of SARS-CoV-2 and the reported generalized vascular and haematological changes including generalized inflammatory response and coagulopathy, there have been questions as to whether SARS-CoV-2 infection might cause placental pathology, which might then affect foetal/neonatal outcomes. Shanes et al (2020), in a case-control study showed that placentas of women infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have higher rates of decidual arteriopathy and other maternal vascular malperfusion features associated with adverse outcomes compared to controls. The placentas of women infected with SARS-CoV-2 showed no significant increase in acute or chronic inflammatory pathology compared to controls. These changes they contend, may reflect a systemic inflammatory or hypercoagulable state influencing placental physiology. They also averred that it is possible viral infections directly leads to placental pathology or that there is a common underlying cause for both placental lesions and susceptibility to SARS-CoV-2. They stated the observed placental changes, if caused by COVID-19, are perhaps related to maternal infection and inflammation rather than fetal infection **(159)**. The nature, duration, and anatomic location of the changes suggest possible antepartum processes that place fetuses at risk for brain injury during the intrapartum period **(173).** Maternal vascular malperfusion (MVM) of the placental bed represents a recognizable pattern of placental injury which consists of pathological changes seen in the maternal decidual vessels, reflecting abnormal spiral artery remodeling, as well as in the villous parenchyma, reflecting abnormalities in

oxygenation and flow dynamics in the intervillous space**.(174).** It is associated with poor perinatal outcome **(175).** It is therefore important for obstetricians to increase antenatal surveillance for women with COVID-19 infection.

MATERNAL OUTCOME

Being pregnant and/or having a baby is, ideally, an event that is associated with joy, delight, and fulfilment, following a safe and positive pregnancy, birth, and early parenthood. However, some women and their partners can experience a range of negative emotions during this period, including anxiety and depression.

Reports indicate that COVID-19 infected mothers do well generally. The clinical manifestations of COVID-19 pneumonia in pregnant women are similar to those reported for non-pregnant adult patients who developed COVID-19 disease **(148).** However cognisant of the similarities between SARS-CoV-2 and SARS-CoV, there have been concerns on possibility that the disease course and prognosis of COVID-19 pneumonia could follow the same trend. During three of the major influenza pandemics of the last 100 years namely (1918, 1957-1958, and 2009), pregnant women in their second or third trimester were considerably more likely to be hospitalized or die compared with the general population. During the 1918 H1N1 pandemic, the case fatality proportion among pregnant women was 27%**(176).** In the most recent influenza pandemic (2009 H1N1), pregnant women in the United States accounted for 6.4% of all hospitalizations and 4.3% to 5.7% of all deaths even though they generally represent only 1% of the population **(2,177).** In the severe acute respiratory syndrome (SARS-CoV-1) outbreak, mortality rate in the general population was 10.5%, whereas that of pregnant women approximated 25% **(136).** In a recent study, Mendoza et al (2020) reported that older pregnant with COVID-19 had severer pneumonia than younger ones with PE-like syndrome **(176).** There have been a few maternal deaths in COVID-19 especially among the critically ill who develop severe pneumonia and multiple organ dysfunction **(145)** just like the general population. Hantoushzadeh et al reported seven maternal deaths out of 9 patients diagnosed with COVID-19 in second trimester in Iran **(152).** In a recent study by the CDC, (one of the largest on vocid-19 to date) analysed information from more than 8,200 pregnant women and 83,200 non-pregnant women in the U.S. ages 15 to 44 who tested positive for COVID-19 between January and June 2020. The study found that about 30% of pregnant women with COVID-19 required hospitalisation, compared with just 6.0% of non-pregnant women. They could not state if some of the pregnant women were hospitalized for delivery or other pregnancy-related procedures, or due conditions specifically related to COVID-19. Pregnant women with COVID-19 were more likely to be admitted to the ICU, (1.5% vs 0.9%) and require mechanical ventilation, (0.5% vs 0.3%0 However the risk of death from COVID-19 was the same for pregnant and non-pregnant women at 0.2% for each. They opined that ICU admission and need for a ventilator are "distinct proxies for illness severity" for COVID-19 **(178).**

On top of mortality, there are morbidities whose impact, short or long-term, on the mother will not be apparent for some time. Mullins et al (2020) reported that serious morbidity occurred in 0.1% (2/32) of women with COVID-19 disease, but compared with SARS and MERS, COVID-19 appears less lethal **(179).** One of the morbidities is psychosocial well-being, an area, which needs attention cognisant of the reported effects in general population. There are fears and anxieties of any new infectious disease on the general population and COVID-19 is no exception. Likewise, there are reports of psychological effects of COVID-19 amongst infected individuals. A survey conducted in China showed

that 53.8% of the respondents rated the psychological impact of the outbreak as moderate or severe, and 28.8% reported moderate to severe anxiety symptoms and stress levels (**180)**. We have witnessed cases of suicide in the current pandemic

Pregnancy represents an additional cause for anxiety and the fear that pregnancy per se increases the risk of severe disease and outcome of the pregnancy might contribute to the psychological challenges for the pregnant woman. Pregnant women are at an increased risk for anxiety and depression. If they are defined with suspected/ probable/ confirmed COVID-19 infection they may exhibit varying degrees of psychologica symptoms that may be detrimental to their health as well as that of the foetus **(181).** Mother-baby separation may impede early bonding as well as establishment of lactation **(182).** Healthcare providers should pay attention to a patient's mental health, including promptly assessing her sleep patterns and sources of anxiety, depression, and even suicidal ideation. Psychological impact and anxiety of the COVID-19 epidemic seems to be more severe in women who are in the first trimester of pregnancy during the outbreak **(183).**

Maternal and parental mental health problems are associated with longer-term risks for the mother, her partner and for their children **(184).** The most recent WHO guidelines for antenatal and for intrapartum care reinforce the importance of positive clinical and psychosocial pregnancy and childbirth experiences to optimise the physical and psychosocial wellbeing of mother, baby, and the family in the short and longer term **(185,186).**

These anxieties are likely to revolve around:

- The virus itself –their own risk of contracting the infection either at home, workplace, in the communities (including public transportation), clinic areas, hospitals, places of worship, markets, etc
- Impact of the disease on their health, pregnancy and neonatal outcomes,
- The impact of social isolation (distancing) resulting in reduced support from wider family and friends, restricting use of house helps.
- The potential of reduced household finances – and impact on maternity care and for the baby after delivery,
- Major changes in general health care service delivery and specifically antenatal care, delivery, and postpartum care, in the era of the pandemic.
- Access to their health care providersin time of need, for those countries under lockdown or curfews, or if they fall sick from the virus themselves
- Health and well-being of othermembers of the family (e.g head (provider) of the family at the critical moment)
- Fear of MTCT
- The risk or presence of domestic abuse or violence,
- Isolation – especially at the time of delivery (no family support),

CONCLUSIONS and WAY FORWARD

- Pregnant women may be at higher risk of severe illness, morbidity, or mortality compared with the general population, likely due to physiological changes during pregnancy, and because pregnancy constitutes a state of relative immunosuppression.
- COVID-19 is associated with other well-known risk factors for maternal morbidity especially those with co-morbidities, are above 35 years old, overweight, and obesity. There is need for studies to determine whether these risk factors are also associated with poorer maternal outcome in these women.
- Although have the same clinical course as non-pregnant women of the same ages, most recent evidence indicate that pregnant women with COVID-19 require hospitalization, ICU admission and mechanical ventilation than non-pregnant women of the same age **(178).**
- Information on the impact of COVID-19 on early pregnancy outcomes remains unavailable at the time of writing. Non-pregnant women of childbearing age are also at low risk of severe disease (**200).**
- There is no evidence of vertical transmission of COVID-19, either during pregnancy, labour, delivery or breast-feeding.
- The placental injuries reported in COVID-19 disease may signal cause for concern.
- Adverse health outcomes have been found in infants born to mothers affected by COVID-19, including respiratory distress, premature labor, and even death. However, it is unclear whether these adverse outcomes are related or not to the COVID-19 infection in their mothers.
- With regards to mode of delivery, this should be individualized and follow standard obstetric indications and not for fear of MTCT of COVID-19 as todate there is no evidence thereof and that women delivered by caesarean section have worse maternal and neonatal outcomes.
- Mothers should be supported to do breastfeeding if they so wish, necessary precautions being taken at all times
- Many pregnant individuals are experiencing increased stress and anxiety due to COVID-19 disease. Thus, when counseling pregnant individuals about COVID-19, it is important to acknowledge that these are unsettling times
- Pregnant and breastfeeding women constitute a significant portion of the population that could be impacted by COVID-19; the numbers of infected pregnant women will definitely increase over time.
- The impact on service deliveryespecially in settings with under-resourced health systems is likely to be substantial.
- There is need for increased antenatal surveillance for women diagnosed with COVID-19.
- Clear protocols and guidelines should be developed for the management of all neonates born to mothers testing positive for COVID-19.
- Until we have a cure forCOVID-19 disease, we need to focus on improving and optimising prevention methods of this highly infectious virus, in all areas of care, including the clinics, labour and delivery units, maternity wards, neonatal wards, and intensive care units.
- We need to conduct more longitudinal case-controlled studies in different areas in ECSA to better understand the disease and its impact on maternal, foetal and neonatal healthso as to guide health care delivery

- There is a need for systematic data reporting on women affected by COVID-19 and their pregnancies to provide an evidence base for management, treatment and prevention, and to target limited resources during the outbreak
- We should start by each country collecting data on pregnant women diagnosed with COVID-19 in their respective countries, which will be collated centrally by the secretariat. This can form our database.

GUIDELINES TO OBSTETRICIANS & GYNAECOLOGISTS IN ECSA

These guidelines should be consideredin conjunction with respective national and/or local guidelines, where they exist, and other related international documents (such as Guidelines from the WHO, UNFPA, UNICEF, FIGO, ACOG, RCOG (UK), Australia and New Zealand).

We are cognisant of the fact that it is not possible to give definitive advice because information remains limited, and what applies in one country, or setting, may not be applicable to another. We will undertake to update the document as new information comes out in what is a rapidly evolving situation.

Health care professionals should follow their health care facility's policies and their local and state health department policies. for notification of a person under investigation for COVID-19

1. PRECONCEPTION CARE

Preconception care is a set of interventions that are to be provided before pregnancy, to promote the health and well-being of women and couples, as well as to improve the pregnancy and child-health outcomes. It will, among other things empower a woman/couple to make informed decision by providing them with sufficient knowledge **(187,188).** Becoming pregnant during the coronavirus (COVID-19) pandemic is a matter of personal choice. All efforts should be made to provide preconception advice to couples of reproductive age, if they are intent on getting a child **(189).** Doing so is not always possible as many pregnancies are unplanned/unintended. According to Singh *et al*. (2010), four in ten women say their pregnancies unplanned. As a result, essential health interventions provided once a woman and her partner decide to have a child will be too late in 40% of pregnancies **(190).T**his is common in our clinical practice as well. There is no official guidance about trying for a baby at this time.

It is our recommendation that a woman/couple planning to get a baby should be appropriately counseled and encouraged to take into serious consideration the risks of,

- Contracting coronavirus during routine contact with health care professionals during pregnancy, particularly if she there are complications, which may necessitate frequent hospital attendance, the risk is even much more.
- Potential health risks to herself, the foetus and neonate especially since we don't know much about the disease on the course of pregnancy
- The risks of exposing health workers she will come into contact with to COVID-19.
- Those undergoing fertility treatments might need to take even more caution before going on with the procedures.

Ideally it would be better to wait, i.e. defer the decision, unless one is desperate

The Faculty of Sexual and Reproductive Healthcare has also recommended that women and their partners consider the risks of coronavirus transmission associated with routine contacts with seeing healthcare professionals for routine care during pregnancy, particularly if they develop any pregnancy complications.

2. ANTENATAL CARE:

The World Health Organization (WHO) envisions a world where every pregnant woman and newborn receives quality care throughout the pregnancy, childbirth and the postnatal period. Within the continuum of reproductive health care, antenatal care (ANC) provides a platform for important health-care functions, including health promotion, screening and diagnosis, and disease prevention. By implementing timely and appropriate evidence-based practices, ANC can save lives. Crucially, ANC also provides the opportunity to communicate with and support women, families and communities at a critical time in the course of a woman's life.

There have been talks of reducing the number of contact visits with health care workers (HCW) for routine care as a measure of controlling the spread of COVID-19.However maternity services are considered an essential health care which should go on uninterrupted during the COVID-19 pandemic. This is perhaps even more so for expectant mothers in ECSA, cognisant of the potential of health issues in pregnancy for which physical contact with a health care worker is necessary.

Using tele-health (or telemedicine) consultations instead of, or in addition to, routine visits, (via phone or zoom, Skype etc), which has been suggested and tried in other settings may not be feasible for the greater majority of women in ECSA. It might also lead to delayed care or/missed opportunity to manage or avert complications.

We wish to recommend that;

- Routine antenatal investigations, ultrasounds, maternal and fetal assessments should continue as before, allowing for appropriate modifications, which can be tailored for individual settings and individual patients.
- Reducing, postponing and/or increasing the interval between antenatal visits should be considered based on national/local circumstances.
- Where possible patients should be seen by appointment to avoid crowding to reduce the risk of COVID-19 infection.
- Patients should be encouraged to use the phone more for non-emergency consultations
- Limit the time of each antenatal visit to not more than 15 minutes
- Women should be advised to attend routine antenatal care unless they meet current self-isolation guidance for individuals and households of individuals with symptoms of new continuous cough or fever

❖ **First ANC visit should**

- o be scheduled as is usual based on national and local guidelines, or when the patient comes for the first time.
- o be as comprehensive as possible aiming at doing all or most requisite antenatal tests at this time
- o provide adequate counselling and explanation on corona virus disease in

general and in pregnancy in particular.
- o avail advice on the dos and don'ts to protect oneself and others.
- o Plan for follow up visits.

❖ **Subsequent ANC visits**

The subsequent visits should be scheduled as recommended in respective national or facility guidelines/protocols, or based on the WHO ANC visit guideline **(191).** For some it might be possible to carry out the consultations virtually, especially for normal pregnancies. This will allow social distancing to protect the woman her baby and clinic staff from coronavirus infection.

For women affected by COVID-19, suspected, or who have been in contact with positive patientsduring an ongoing pregnancy,

- Should be managed according to respective national protocols
- Need foetal growth surveillance, given the acute and chronic placental changes, which might arise.

(Where these do not exist, we recommend the WHO, UNFPA, FIGO, UNICEF guidelines)

3. INTRAPARTUM CARE

Intrapartum care should be provided as it's usual practice. Whether one is positive, suspected to have infection or not she should be delivered in a health facility.

Patients with known or suspected COVID-19 should be cared for in a single-person room with the door closed. Airborne Infection Isolation Rooms may be reserved for patients undergoing aerosol-generating procedures.

❖ **Mode of delivery**

Decisions regarding the mode of delivery should be on obstetric indication and not on the presumed protection of the baby against infection. Vaginal delivery is recommended for majority of cases as has been shown to be safer for both mother and neonate than caesarean section.

There is no evidence that caesarean section or induction of labour is necessary for reduction of the risk of vertical transmission. Mode of birth should be individualized based on obstetric indications and the woman's preferences. WHO recommends that caesarean section should ideally be undertaken only when medically justified

❖ **Timing for delivery**

A woman's experience of labour and vaginal birth, or caesarean section, should not be significantly impacted and women should be encouraged, and supported, to approach this extraordinary time of their lives without fear or apprehension

The timing;

- should follow local or national guidelines and best practices.
- It should be individualized, based on ones obstetric and medical history.
- There is no rationale for elective delivery either surgically or otherwise because of the covid-19 disease.

If a woman has COVID-19 infection, or has had significant exposure, unless there are immediate risks to her health, or other obstetric indications, elective caesarean section or induction of labour should be delayed, if possible.

❖ **Place of delivery**

The safest place to deliver is in a health facility, where there is access to skilled attendance and emergency facilities, whenneeded.

For confirmed or suspected cases ofCOVID-19 disease they should be delivered in a tertiary facility with resuscitation equipment and other supportive measures and centres with appropriate neonatal intensive care facilities for delivery as COVID-19 is associated with preterm delivery.

- **First stage of labour**
  - Patient should be made as comfortable as possible,
  - The patient and the support should wear masks all the time,
  - Each patient should have no more than one family member present – preferably a spouse with whom they share a room at home
  - There'd be as few patients as possible in the labour place,
  - Limit the number of staff attending to the patient
    - There'd put on requisite PPE at all times.
  - Limit the number of supporting family to one per patient.
  - Should get adequate hydration and feeding;
  - Foetal monitoring with CTG as much as possible.
  - Routine examinations and other tests should be carried out as necessary.
  - Pain relief should be given as necessary – including epidural analgesia.
    - There is limited information regarding the use of nitrous oxide in labour.
    - Nitrous oxide should not be routinely provided to women who are defined as suspected, probable or confirmed for Covid-19 infection.
    - If nitrous oxide is used all attendant staff should wear appropriate PPE, as determined by the local health jurisdiction.
    - Nitrous oxide may still be offered to women at low risk of Covid-19, as deemed appropriate by the midwife

- **Second stage of labour**

  - It is recommended to expedite delivery of the baby in the second stage especially for the very sick to reduce burden on the cardiorespiratory system.
  - There is insufficient evidence regarding whether delayed cord clamping increases the risk of infection to the newborn via direct cord clamping should be managed normally **(192)**

- **Newborn care**

  - Infants born to patients with known COVID-19 at the time of delivery should be considered infants with suspected COVID-19.
    - As such, they should be tested, isolated from other healthy infants, and cared for according to the nationalguidelines or where not available, WHO, UNICEF, UNFPA guidelines.
  - Infants born to a pregnant individual with suspected COVID-19 for whom testing is unknown (either pending results or not tested) are not considered to be infants with suspected COVID-19.
    - These may need to be isolated for some time or just kept together with the others (depending on national or local protocols).

- Facilities taking care of pregnant women, may consider temporarily separating (e.g.separate rooms), patients confirmed or are under investigation for COVID-19 infection, from their newborns until the time when they are considered free or safe to bond with their newborns,
- There are concerns that separation of mothers from their newborns may be to risks such as undue stress on the patient and disruption of breastfeeding.
- Thus, determination of whether to keep patients with known or suspected COVID-19 and their infants together or separated after birth should bemade on a case-by-case basis, using shared decision-making between the patient and the clinical team.
- Suspected or proven cases of newborns with symptoms should be place under quarantine in the neonatal intensive care unit for at least 14 days with requisite precautions.
- When transferring a newborn from one facility to another, it should be in a dedicated transport incubator and ambulance with isolation precautions.

  Routine separation of mother and baby should be a last option and perhaps for the critically ill and this should be based on guidelines and best-practices **(193)**

❖ **Postpartum care**

- The mother and her newborn should ne discharged home as early as possible, to minimize risk of contracting COVID-19infection and or infecting

staff and/or other patients unless they are too sick and require hospitalization.

- Discharge for postpartum individuals with suspected or confirmed COVID-19 should follow national/facility protocols.

- **Breastfeeding**

  - Breastmilk is the best source of nutrition for babies and protects them against childhood illnesses such as diarrhea, respiratory infections.
  - Disruption of breastfeeding can lead to
    - a drop in milk supply,
    - refusal by the infant to take the breast, and
    - a decrease in protective immune factors contained in breastmilk.

  Before ignoring and/or discouraging breast feeding by default in a SARS-CoV-2-positive mother at delivery, we should carefully consider the following.

  - Whether the virus can be transmitted through breast milk, or whether an infected mother can transmit the virus through respiratory droplets during the period of breastfeeding.
    - Since breastfeeding has been shown to be free of corona virus, the only risk is through respiratory droplets from the mother.
    - Thus, the mother should be encouraged and supported to wash her hands before touching the infant and wearing a facemask, while feeding at the breast. These, remain effective basic preventive measures.
  - Whenever direct breast-feeding is not recommended on a case-by-case basis, use of expressed mother's milk should be considered, to ensuremaintenance least the benefits of the nutrition with mother's milk, if not those related to direct breast-feeding.
  - In the light of limited scientific evidence, breast milk cannot be considered per se a vehicle of SARS-CoV-2 infection, while on the contrary contains specific antibodies possibly modulating an eventual SARS-CoV-2 infection in the newborn infant.
  - In conclusion, protocols applied in maternity hospitals to prevent COVID-2 should consider, as far as possible, the promotion of breast-feeding, without disregarding the feasible option of expressing mother's milk.
  - A mother with confirmed COVID-19 or who is a symptomatic persons under investigation should take all possible precautions to avoid spreading the virus to her infant
  - Despite lack of evidence to date to suggest the novel coronavirus can pass to infants through breast milk, the CDC issued precautionary guidance for women with suspected or confirmed COVID-19 who are also breastfeeding **(198).**

  Women who wish to breastfeed their babies should be encouraged and supported to do so. At the moment there is no evidence that the virus is carried in breastmilk and, therefore, the well-recognised benefits of breastfeeding outweigh any potential risks of transmission of COVID-19 through breastmilk.

If the mother has COVID-19 infection she should not be automatically separated from her baby, but should take recommended precautions to protect the baby. In case the mother is too sick to breastfeed, attempts should be made to express breast milk and baby fed by cup. Breastfeeding should be reinstated as soon as the mother is healthy enough to do so. The World Health Organization (WHO), United Nations Children's Fund, Center for Disease Control and Prevention (CDC), Royal College of Obstetricians and Gynaecologists among others (193-198), also recommends this**.**

If expressing breast milk with a manual or electric breast pump, the mother should wash her hands before touching any pump or bottle parts and follow recommendations for proper pump cleaning after each use. If possible, consider having someone who is not sick feed the expressed breast milk to the infant.

Some mothers may choose to wear a mask during feeding as a routine to ensure that their child is fully protected. If a mother suspects that she may have contracted coronavirus, she may wish to express her breastmilk and feed the baby using a clean cup or cup and spoon.
The three **Ws** for mothers wishing to breastfeed their newborns

- **W**ear a mask during feeding,
- **W**ash hands with soap before and after touching the baby,
- **W**ipe and disinfect surfaces regularly.

- If a decision is made to put the baby on formula feeding, the following precautions should be considered

  - important that babies are being fed according to the instructions on the packaging and that
  - extra care is taken with thoroughly washing bottles, teats and any other equipment used. The 3 **Ws** should be followed at all times.

Postnatal Visits

Postnatal care is part of the continuum of maternity care. It is an essential health care. Thus, as much as it is practically possible mother and their babies should be scheduled for postnatal care.

Postnatal care and advice to the mother infected with COVID-19 should be as per routine practice. If the woman is isolated from the neonate, she should be offered psychological assessment and support

The same principles as for antenatal care apply here.

- Mothers should be encouraged and supported to use virtual consultations if feasible, especially for the normal deliveries and parous.
- The ones, who had confirmed COVID-19 during pregnancy, labour or in the immediate postpartum period, should be scheduled for consultant review.

- Continue counselling and advice on protective measures for herself, her newborn and the rest of the family, during the consultations either face-to-face or virtual.
- Family planning counselling and service provision should be included in these consultations

PRECAUTIONS FOR HEALTH CARE PERSONNEL

The impact of COVID-19 pandemic on acute health care services in ECSA is likely to be substantial. HCW, whether based in health facilities or within the community, are essential health care workers and must be protected and prioritized to continue providing care to childbearing women and their babies. They should have full access for all personal protective equipment (PPE), sanitation and a safe and respectful working environment. This will ensure provision of quality care for women and their newborns **(201)**

All HCWs caring for potential or confirmed COVID-19 patients pregnant women and their newborns should have the necessary PPE, information and access to appropriate sanitation to protect themselves and their patients from contracting COVID-19 infection.

They should follow national or facility protocols on;

- The use of personal protective equipment (PPE), including respirators (eg. N95 respirators).
- Use eye protection:
- Appropriate gowning -
- Use of appropriate gloves.

These must be donned and removed/discarded according to laid down guidelines.
Gloves and a plastic apron need to be worn during the delivery of care that may involve exposure to blood, body fluids, secretions, excretions, touching oral mucosa, or medication assistance (including: taking blood or vaginal swabs, performing a stretch and sweep and first stage of labour). During second and third stage of labour, in addition to hand washing, a surgical mask, plastic apron, eye protection, a plastic apron and gloves need to be worn**(202)**

- wash their hands with soap and water frequently, and thoroughly for at least 20 seconds, and dry using a clean cloth or single use towel for drying hands.
- Hand sanitizer can also be used, particularly as a backup for where there is an unreliable water source.
- Undertake all other recommended preventive strategies, such as
    - Avoid touching the eyes, nose and mouth
    - Cough or sneeze into a tissue or their elbow and to wash hands after coughing and sneezing,
    - Maintain social distancing of at least 1.5 metres as much as possible during any clinical encounter.
        - Physical examination and patient contact should continue as usual for women without suspected/confirmed COVID-19 if hand washing is performed before and after.
    - Clean surfaces used by patients and staff with a cleaning product (i.e.: 0.5% sodium hypochlorite (bleach)) and wiped down with a paper towel or clean cloth in between patients, followed by hand washing **(196,198).**

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