



Review Article

The recent outbreak of COVID -19 in pregnancy & its management

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ABSTRACT

COVID 19 pandemic is a crisis of global proportions which has transformed the prospective of entire world. The novel infection brings with it uncertainty regarding evolution of the infection and its spread. Many departments of medical and surgical faculty have withheld or postponed their elective procedures. Even the emergencies are tackled as much as possible by conservative approach. Matters related to childbirth cannot be delayed indefinitely. Given the propensity of the virus to affect large numbers, the chance of pregnant women getting infected is inevitable. The maternity health care providers and facilities need to prepare for the situation with a view to prevent the spread of the infection from infected person to pregnant women. An insight into the management plans of pregnant women with or suspected COVID -19 need to be outlined. These are of paramount importance because our preparedness at this level will pave way for a protected future of both mother and child. This article gives an insight into the current infections caused by coronaviruses.

Health care systems across the globe are under great stress. The stress is not only the numbers, heavy workload, high infective rate but also the concern of health care workers of their own health and well being of own family members with an unknown pathogen. There are limitations of infrastructure, supply chains, only limited knowledge of the management options available and execution of plans on ground. The present article gives an insight into the current infections caused by coronaviruses. Attempts to outline the management which may be beneficial. However, ongoing research on this unknown pathogen may bring additions paving way for better management and a major breakthrough much to the relief of the healthcare system worldwide. This article gives an insight into the current infections caused by coronaviruses. It entails and recognizes the experiences gained in management of MERS (Middle Eastern Respiratory Syndrome) and SARS (Severe Acute Respiratory Syndrome) and how this experience may be utilized in outlining the management of novel COVID-19 pandemic in India.

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1. Introduction

The coronavirus COVID 19 pandemic is a crisis of global proportions which has transformed our world view. The novel infection brings with it uncertainty regarding evolution of the infection and its spread. There is huge probability of community spread in next few weeks in India. At present the Government and health care providers are in preparation mode. Many departments of medical and surgical faculty have withheld or postponed their elective procedures. Even the emergencies are tackled

as much as possible by conservative approach. Matters related to childbirth cannot be delayed indefinitely. Given the propensity of the virus to affect large numbers, the chance of pregnant women getting infected is inevitable. The maternity health care providers and facilities need to prepare for the situation with a view to prevent the spread of the infection from infected person to pregnant women. An insight into the management plans of pregnant women with or suspected COVID -19 need to be outlined. These are of paramount importance because our preparedness at this level will pave way for a protected future of both mother and child.

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Health care systems across the globe are under great stress. The stress is not only the numbers, heavy workload, high infective rate but also the concern of health care workers of their own health and well being of own family members with an unknown pathogen. There are limitations of infrastructure, supply chains, only limited knowledge of the management options available and execution of plans on ground. The present article attempts to outline the management which may be beneficial. However, ongoing research on this unknown pathogen may bring additions paving way for better management and a major breakthrough much to the relief of the healthcare system worldwide.

2. The Coronavirus

Novel Coronavirus (SARS-CoV -2) is a new strain of coronavirus causing COVID-19, first identified in Wuhan City, China. Its typical character especially person to person transmission was documented in December 2019.¹ There are number of coronavirus infections that have been identified and are pathogenic to humans including the common cold, the virus that causes MERS (Middle Eastern Respiratory Syndrome) and SARS (Severe Acute Respiratory Syndrome) (Table 1).

The COVID-19 strain of coronavirus infection has high rate of transmission by droplet and fomites¹ coronaviruses are single stranded RNA, non segmented, enveloped viruses, which cause illness ranging in severity from the common cold to severe and fatal illness. In the past decade, two other coronaviruses that cause severe respiratory illness in humans have emerged; severe acute respiratory syndrome coronavirus (SARS-CoV) and the Middle East respiratory syndrome coronavirus (MERS –CoV). With the emergence of SARS –CoV -2, a third coronavirus that can cause severe respiratory illness has been identified. World Health Organization has declared COVID -19 as a pandemic.² Most countries across the globe have recognized this as a national emergency and have started taking measures against the infection.

Modified from Rasmussen et al.³

3. Clinical Manifestations of Coronaviruses

The mean incubation period of COVID -19 is 5-7 days. Most people who are infected will show features latest by 11 days of exposure.⁴ A history of travel abroad or contact with someone who has travelled abroad should be included in the history taking. The pregnant women do not appear to be more susceptible to consequences of infection of COVID-19 than general population.⁵ (Table 2).

Most pregnant women will have mild to moderate flu- like symptoms of cough, sore throat and fever. Few may have difficulty in breathing or shortness of breath. These have been classified as features of severe acute

respiratory illness (SARI) by WHO. Pregnant women especially those associated with medical diseases (diabetes, asthma, renal disease etc) may present with pneumonia and marked hypoxia. Immunocompromised and elderly pregnant women may present with atypical features such as fatigue, malaise, body ache and gastrointestinal symptoms like nausea and diarrhea.⁶

4. SARS and its Effects on Pregnant Women

In the largest case series of pregnant women with SARS from the 2003 outbreak in Hong Kong, in which 12 pregnant women were identified.⁷ Pregnancy outcome varied by trimester of presentation.⁷ Among the 7 women who became ill in the first trimester, four had a spontaneous abortion, two had pregnancy termination for social reasons after recovery from SARS, and one delivered a full term healthy infant. Among the five women who presented after 24 weeks, four delivered preterm. Three women delivered by cesarean delivery due to deteriorating maternal condition from their SARS illness at 26, 28 and 32 week's gestation.⁸ These babies had birth weights appropriate for gestation age. Two of the infants had respiratory distress syndrome requiring surfactant (born at 26 and 28 weeks gestation), with one later developing bronchopulmonary dysplasia. Gastrointestinal complications were observed in two infants, including a jejunal perforation in an infant delivered at 26 weeks and necrotizing enterocolitis with ileal perforation in an infant delivered at 28 weeks gestation. The two infants who were delivered after their mothers' recovery from SARS had intrauterine growth restriction. No clinical, radiologic, or laboratory evidence for transmission from mother to fetus was observed, despite laboratory testing of different specimens.^{9,10}

Hospitals in Toronto and Hong kong reported measures instituted on obstetrics services during the SARS outbreak to decrease transmission to pregnant women, their families, community members and health care workers.^{11,12} The measures included screening of staff, patients and visitors for symptoms at hospital entrance, use of N95 masks, restriction of visitors in the hospital, decrease i the length of postpartum stay and 10 days home quarantine. Obstetrics services considered non essential such as routine ultrasound and prenatal diagnosis were suspended. Similar interventions are now been used in the approach to COVID 19.

5. MERS and its Effects on Pregnant Women

Information on MERS among pregnant women is limited. About 13 cases of pregnant women with MERS from several countries including Saudi Arabia, Korea, Jordan, United Arab Emirates and Philippines.^{12–19} Seven of 13 patients were admitted to an intensive care unit for respiratory deterioration or ARDS, 5 required ventilator support, 3 died

Table 1: omparison of characteristics of severe acute respiratory syndrome (SARS) middle respiratory syndrome (MERS) and coronavirus disease (covid-19)

Characteristics	SARS	MERS	Covid-19
First patient reported	Guangdong, China, Nov 2002	Zarga, Jordan, April 2012 Jeddah, Saudi Arabia, June 2012	Wuhan, China 2019.
Virus	SARS-CoV	MERS-CoV	SARS –CoV -2
Type of virus	Beta coronavirus	Beta coronavirus	Beta coronavirus
Host cell receptor	Angiotensin converting enzyme 2	Dipeptidyl peptidase 4	Structural analysis suggests Angiotensin converting enzyme 2 receptor
Sequence similarity			79% to SARS Co V, 50% to MERS –CoV
Animal Hosts	Bats (natural reservoir), Masked palm civet, Raccoon dogs /man gut (Intermediate host)	Bats (natural reservoir) Dromedary camel (intermediate host)	Bats (natural reservoir) Sea food market in Wuhan might represent an intermediate host
Incubation period Mean (95% CI :day)	4.6 (3.8-5.8)	5.2 (1.9-14.7)	5.2 (4.1-7.0)
Time from illness onset till hospitalization	2-8 days	0-16 days	12.5 days (10.3-14.8)
Basic reproduction number (R0)	2-3 days	<1 day	2.2 (1.-3.9) day
Patient characteristic			
Adult	93%	98%	Nearly all reported cases are adult
Children	5-7%	2%	<1%
Age range (years)	1-91	1-9	10-89 years
Average age	Mean 39.9n	Median 50	59 years (median)
Sex ratio (M:F)	43% : 57%	64.5%-35.5%	56%-44%
Case fatality rate	9.6%	35-40%	Initial estimate variable upto 10%

Table 2: Clinical features of SARS, MERS and COVID 19 infection

	SARS	MERS	COVID-19
Fever	99-100%	98%	83-100%
Cough	62-100%	83%	59-82%
Myalgia	45-61%	32%	11-35%
Headache	20-56%	11%	7-8%
Diarrhea	20-25%	26%	2-10%

and 8 recovered. Among the three deaths, the mothers died 8-25 days post delivery. Both babies born to asymptomatic women were born healthy at term. Among symptomatic women, there was one intrauterine demise, one stillbirth, one delivered 25 weeks who died 4 hours after birth, two healthy preterm infants and five healthy term infants.

6. Implications of COVID -19 for Pregnant Women

With the experience gained during infections with SAARS and MERS (causative organisms being coronavirus), the unique needs of pregnant women with COVID -19 need to be tackled with preparedness and response plans. As with all decisions regarding treatment during pregnancy, carefully weighing of the benefits of interventions for the mother and fetus with potential risks is necessary.

The following measures need to be recognized and implemented for better management of COVID -19 outbreaks.

7. Measures for Pregnant women to Prevent COVID-19 Infection

The greatest measure or tool to prevent COVID-19 infection in general population and also applicable to pregnant women is social distancing. As per the Government of India advisory, social distancing is an important non –pharmaceutical infection prevention and control intervention to avoid or decrease contact between those who are infected with the pathogen and those who are not, so as to stop or slow down the rate and extent of disease transmission in a community.²⁰ The advisory essentially

focuses on the need to isolate oneself. Some important aspects for pregnant women in India from the advisory are:

1. Disinfection of surface to reduce fomites related spread
2. Prefer work from home
3. Keep a distance of at least one meter during interactions with individuals
4. Avoid non essential travel. If travel is undertaken, it is preferable to use a private /own vehicle over public transport
5. Avoid gatherings and functions
6. Minimize visitors

For asymptomatic and uninfected women, recommended strategy for antenatal care is to defer routine visits.²¹ Consult healthcare provider telephonically or through web for minor ailments and questions.

1. The visits at essential milestone such as 12, 19 weeks scan is however mandatory or never avoided.
2. Advised to note fetal movement's every day.
3. The visit at 32-3 weeks also mandatory and then in consultation with healthcare provider.

8. Protective Measures

Pregnant women are a special category in terms of healthcare and are more susceptible. They should follow "DO THE FIVE" based on following principal elements (Tables 3 and 4).

8.1. Testing for COVID -19

The Guidelines given by Indian Council for Medical Research (ICMR) for pregnant women give recommendations for tests in following circumstances –

8.2. Pregnant women who has acute respiratory illness with one of the following criteria

1. History of travel abroad in the last 14 days (6. 3.2020 onwards). In addition to testing, these individual (with or without symptoms) and their household contacts should home quarantine for 14 days.
 2. Is a close contact of a laboratory proven positive patient or
 3. She is a healthcare worker herself or
 4. Hospitalized with features of severe acute respiratory illness.
2. A pregnant woman who is presently asymptomatic should be tested between 5 and 1 days of coming into direct and high risk contact of an individual who had been tested positive for the infection.

As per the guidance from the Government of India, direct and high risk contact is defined as those living in the

same household, travelling together in conveyance, working together in close proximity (same room), or healthcare workers providing direct care.²³

8.3. Test methods and facilities

The CDC recommends collection of a nasopharyngeal swab specimen to test for COVID -19(25). An oropharyngeal swab can be collected but is not essential, if collected, it should be placed in the same container as the nasopharyngeal specimen. Sputum should only be collected from patients with productive cough; induction of sputum is not indicated. COVID-19 is detected by reverse –transcription polymerase chain reaction (RT-PCR). The test should be performed from a centre which is authorized by the Government of India and State Governments. The detailed guidelines on testing are available on ICMR website.^{24,25} The guidelines highlight the preference for home collection of samples, maintaining safety during transport, disposal, guidance on disclosing results and fees. Reports should generally be available in 24 hours. More rapid molecular diagnostic tests which have been manufactured in India approved by FDA and ICMR give results in 2-3 hours are also been used.

At present, the RT-PCR is recommended by the ICMR. However, false negative tests are known to occur to the rate of 10-30% even with two serial swabs tested by the RT-PCR technique. In the near future, testing may be conducted by Nucleic Acid Amplification Test (NAAT) or by serological testing. NAAT is gold standard test. It is expensive and involves the risk of multiplication of viral particles. Serological testing is faster and cheaper. At a population level, serological testing may be more feasible to see the prevalence. Also, after 3 weeks of infection, the RT-PCR would be negative, but serology would give the diagnosis.²⁶ The laboratory findings are illustrated in Table 5.

8.4. Labor triage for women with COVID -19 infections

A protocol should be in place in the maternity unit to receive pregnant women in labor or suspected labor with confirmed or suspected COVID-19 infection. The plan like following may be instituted (23) –

1. The women should call in advance to alert the maternity unit about her arrival whenever this is possible. This gives time for healthcare workers to prepare in triage and don PPE.
2. The women should use private transport or ambulance to reach the maternity unit, Public transport use should be deferred.
3. She should be received by appropriately donned PPE at reception itself.
4. Reception and triage in the same room, to be used for admission. This should preferably have negative

Table 3: Protection of health care workers

Home	Stay at home unless there is a need for medical help Routine Antenatal Visits deferred. Telephonic consultation permitted by the Medical Council of India till the situation comes under control ²² Keep away from visitors at home.
Hands	Wash hands frequently and properly with soap and water or alcohol based hand rub for an minimum 20 seconds.
Elbow	Elbow Cover mouth and nose with bent elbow, handkerchief, or tissue while coughing or sneezing. The used tissue should be disposed immediately. Thus ensuring respiratory hygiene.
Face	Avoid touching face, eyes, nose and mouth with hands.
Space	Keep a distance of at least one meter from any individual.

Table 4: Expected life of coronavirus

Surface	Example	Time
Metal	Doorknobs, Jewellery, Silverware	5 Days
Glass	Drinking glasses, Mirrors, Windows	Up to 5 days
Ceramic	Dishes, Pottery, mugs	5 days
Paper	Newspaper, Magazines	Up to 5 days
Wood	Furniture, Desking	4 days
Plastic	Milk bottles, Bus seats, elevator buttons	2-3 days
Stainless steel	Refrigerators, Pots/pans, Sinks, water bottles	2-3 days
Card board	Shipping boxes	1 day
Aluminum	Soda cans, Tinfoil, Water bottles, car keys	2-8 hours
Copper	Currency coins, Cookware	4 hours
Food / Water		Does not spread
Stool		Up to 29 days
Blood samples		

Table 5: Laboratory findings

Laboratory findings	SARS	MERS	COVID-19
Radiographic abnormalities on chest imaging	94-100%	90-100%	100%
Leucopenia	25-35%	14%	9-25%
Lymphopenia	65-85%	32%	35-70%
Thrombocytopenia	40-45%	36%	5-12%
Elevated liver enzymes			3-4%
Acute infection markers			10-15%
CT SCAN & Imaging modalities (Chest X-ray with abdominal shield)			Consistent with atypical pneumonia

pressure rooms.

5. Keep the room free from unnecessary items and decorations which could act as infected fomites later.
6. There should be restriction on the number of attendants allowed with the woman. There should be a restriction on the entry and exit of non essential staff into the room. The companion of the woman should be treated as infected and all precautions should be taken.

Anticipating a potential increase in number of COVID -19 infected patients, institutional preparedness and conduct of mock drills for standard operating procedures should be encouraged.^{27,28}

8.5. Management of labor and delivery in women with COVID -19 infections^{26,27,29}

1. Maternity care providers should continue to provide client –centered, respectful skilled care and support.
2. Due Consent describing the condition and possible outcomes due to infection with COVID -19 & according to Obstetric and medical condition is a must.
3. Birth attendants should be limited usually one deputed for one delivery.
4. Adequate counseling of the mother about the infection.
5. Separate delivery room and operation theatres are required for management of suspected or confirmed COVID -19 mothers.
6. Neonatal resuscitation corners should be located at least 2 m away from delivery table.

7. Standards and facilities required for infection control in these areas should be same as that for other adults with suspected or confirmed COVID -19 infections.
8. Depending on the clinical picture and severity of the condition, a multispecialty team may be involved in caring for the pregnant women in labor.
9. Anesthetist and neonatologist should be informed of such a woman presenting in labor.
10. If woman presents in preterm labor, tocolytics are contraindicated following the general principles of avoiding such an intervention with systemic disease.
11. If there is pulmonary involvement, beta –mimetic agents should be avoided. Each case be individualized and treated with due consent of patient and relative clearly explaining all pros and cons.
12. Time of delivery should not be altered on the basis of COVID -19 infections. The presence of infection is not an indication to induce labor or deliver the woman. The only exception to this would be the critically ill pregnant woman where delivery may be indicated to relieve the extra metabolic and pulmonary load. The possible benefits of this need to be weighed against the possible risks of worsening the systemic status with a surgical intervention.
13. In labor, monitoring should include periodic evaluation of respiratory status with watch for symptoms of difficulty or shortness of breath, respiratory rate, pulse rate and oxygen saturation on pulse oximetry. On deterioration of these features, intensive care measures would be required including ventilation.
14. Standard Obstetric care should be strictly adhered to.
15. With every examination and contact, healthcare workers should be mindful of adequate protective gear.
16. An intravenous access should be established and fluids should be restricted in labor.
17. Second stage of labor should be cut short to prevent maternal exhaustion and reducing maternal efforts, in case where there is respiratory involvement by the infection.

8.6. *Labor analgesia and anesthesia in pregnant women with COVID -19 infections*²⁸

1. A team of anesthetists should be available with a senior anesthetist taking the clinical lead.
2. There is no evidence that epidural or spinal analgesia is contraindicated in the presence of coronavirus. Therefore, a COVID-19 infected woman who is fit enough to labor can be offered epidural analgesia. If she requires a cesarean delivery, the same epidural can be continued and general anesthesia can be avoided.
3. For most cases, spinal anesthesia is suitable.
4. In situations where there is respiratory compromise, general anesthesia (GA) and subsequent ventilation

will be needed. If GA is administered, preoxygenate the patient for five minutes with 100% oxygen and perform rapid sequence induction (RSI) to avoid manual ventilation of the patient's lungs. Use a video –laryngoscope to improve intubation success and avoid awake fibreoptic intubations, when possible. Since this is the procedure that induces aerosolization. The need of full PPE is mandatory as mentioned. A high efficiency hydrophobic filter between the facemask and breathing circuit or between the facemask and reservoir bag to avoid contaminating the atmosphere.

8.7. *Testing for the newborn*

Tests are indicated in neonates–³⁰

1. Neonates born to mothers with COVID -19 infections within 14 days of delivery up to 28 days after birth.
2. Symptomatic neonates or neonates of mother who is COVID positive.

8.8. *Breast feeding and COVID -19 infected mother*³¹

As present knowledge stands, there is no evidence that COVID -19 is secreted in breast milk. The CDC States that “we do not know whether mothers with COVID -19 can transmit the virus via breast milk “. However, cautious approach is required. The main risk for infants of breast feeding is the close contact with the mother, who is also likely to share infective airborne droplets.

As breast milk is the best source of nutrition and immunity for the infant, UNFPA encourages it. However, the following precautions should be taken to limit spread to the baby:

1. Pregnant woman should wash her hands before and after touching her baby.
2. Mother should practice respiratory hygiene by wearing a mask and not sneezing in front of a baby during breast feeding.
3. All surfaces should be kept clean and disinfect she has touched.
4. COVID -19 infected mother may be encouraged to use breast pump to express milk with proper aseptic precautions and maintain hygiene.
5. She may consider asking someone who is well to feed expressed milk to baby.

8.9. *Postnatal care and advice to the mother infected with COVID-19*

1. Continue medical evaluation for respiratory status and symptoms and standard practices of routine postnatal care. attempts to outline.
2. Maintain good practices of hygiene related to the puerperium and hand hygiene.

3. Emphasize social distancing and need for evaluation if symptoms of acute respiratory illness (SARI) arise after delivery.
4. Psychological support should be given.

9. Conclusion

The COVID -19 outbreaks is rapidly increasing in number of cases and deaths across countries. Much is unknown about the virus and its effects, including its modes of transmission, the basic reproduction number, risk factors for illness, and case fatality rate. At present limited data are available on pregnant women with COVID -19 on which to base recommendations for pregnancy –specific care; however, early reports and lessons from SARS, MERS, and other respiratory infections suggest that pregnant women could have a severe clinical course. It is important to be vigilant about the spread of the disease and be able to provide rapid implementation of outbreak control and management measures once the virus reaches a community.

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12. Conflict of Interest

None.

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