

## Review Article

# Management of pregnant laboring women during COVID-19 pandemic

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## Abstract

Since its first outbreak in December 2019 in Wuhan, China, coronavirus disease 2019 (COVID-19) has become a global public health threat. In the midst of this rapidly evolving pandemic condition, the unique needs of pregnant women should be kept in mind while making treatment policies and preparing response plans. Management of COVID-19 parturients requires a multidisciplinary approach consisting of a team of anesthesiologists, obstetricians, neonatologists, nursing staff, critical care experts, infectious disease, and infection control experts. Labor rooms as well as operating rooms should be in a separate wing isolated from the main wing of the hospital. In the operating room, dedicated equipment and drugs for both neuraxial labor analgesia and cesarean delivery, as well as personal protective equipment, should be readily available. The entire staff must be specifically trained in the procedures of donning, doffing, and in the standard latest guidelines for disposal of biomedical waste of such areas. All protocols for the management of both COVID-19 suspects as well as confirmed patients should be in place. Further, simulation-based rehearsal of the procedures commonly carried out in the labor room and the operation theaters should be ensured.

**Keywords:** Anesthesia, COVID-19, labor analgesia, pregnant laboring women

## Introduction

Since its first outbreak in December 2019 in Wuhan China, coronavirus disease 2019 (COVID-19) has become a global public health threat, having spread to almost 118 countries worldwide.<sup>[1,2]</sup> Currently, more than 100 million women are pregnant worldwide, and many of them are at a risk of contracting this deadly infection. However, till date there are no data to suggest that pregnancy per se increases the likelihood of contracting this infection.<sup>[3]</sup> Thus, in the midst of this rapidly evolving pandemic condition, the unique needs of pregnant women should be kept in mind while making treatment policies and preparing response plans.

## Testing for COVID-19 during Pregnancy

Pregnant women who screen positive as per the screening criteria (similar to nonpregnant) are tested for COVID-19. These may be symptomatic women who are contacts of laboratory confirmed cases, symptomatic health-care workers, and women who are hospitalized with influenza-like illness or severe acute respiratory infections. Asymptomatic women who are direct and high-risk contacts of a confirmed case should be tested once between day 5 and day 14 of coming in contact.<sup>[4,5]</sup>

## Preparation for COVID-19-Positive Parturients

Management of COVID-19 parturients requires a multidisciplinary approach consisting of a team of anesthesiologists, obstetricians, neonatologists, nursing staff, critical care experts, infectious disease, and infection control experts.

### Patient room/labor room

Women who test positive should be isolated as soon as possible, ideally in an airborne infection isolation room (single-patient negative-pressure room with 10–12 air changes per hour).<sup>[6]</sup>

The isolation room should be in a separate wing isolated from the main wing of the hospital. In hospitals that do not have this facility, patients should be kept in a zero differential pressure room with good sunlight and natural ventilation.

### Operating rooms

A designated operating room (OR) for surgical interventions on COVID-19-positive patients should be present, preferably in an isolated area of the hospital. Negative pressure ORs would be ideal to minimize infection risk. The standard design guidelines for air conditioning in operation rooms include 25–30 air changes per hour, out of which 10 should be of fresh air. These should be ensured in COVID-19 ORs also.<sup>[7,8]</sup> Also it should be ensured that there are proper signages on such OR doors regarding infectious cases. Further proper door seals, optimum temperature between 22 and 24°C, and a relative humidity of 50–55% are essential. In instances where there is suboptimal air conditioning or negative pressure in the ORs is not available, the air conditioners must be turned off. This should be done specially while carrying out aerosol-generating procedures (intubation, extubation, and bronchoscopies).<sup>[7,8]</sup>

A donning and doffing area should be established. The route of confirmed COVID-19 patient from their primary isolation area to the OR should be prefixed. These positive patients should be wearing a N95 mask during transport.

Multidisciplinary team consisting of obstetricians, anesthesiologists, neonatologists, technologist, and scrub nurse should be readily available. The transfer pathway for the neonate from the OR should be predefined.

In the OR, dedicated equipment and drugs for both neuraxial labor analgesia and cesarean delivery should be readily available. Equipment kept in each OR must be minimized to what is strictly necessary in a case-to-case basis, as well as selecting single-use equipment whenever possible. Similarly, the staff in the OR should be limited. Personal protective equipment (PPE) for the entire team should be available.

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The PPEs for such areas should consist of N95 respirators, and/or a face shield, eye protection, gowns or coverall, and double gloves. The entire staff must be specifically trained in the procedures of donning, doffing, and in disposal of used or infected PPEs. The OR team should also be well versed in the standard latest guidelines for disposal of biomedical waste of such areas.<sup>[7-9]</sup>

Communication and recognition of team members is a huge issue in an operation theater after donning PPEs. Individual names and roles of all members of the team in the operation theater should be clearly mentioned on the front and back of the coveralls. Words coming out of multiple layers formed by N95 masks and face shield are often garbled or completely missed that could lead to drug errors or suboptimal care. A team meeting prior to donning should assign individual tasks to all team persons so as to ensure the correct sequence of events.

## General Principles for Management of Confirmed/Suspected COVID-19 Pregnant Women

For all operative procedures, regardless of the type of anesthesia, as well as while entering the labor room, all health-care workers should don the PPE (level as described above). Health-care workers may receive HCQS (Tablet hydroxychloroquine) prophylaxis as per the local hospital policy or ICMR protocol.

Majority of pregnant women, like the general population, present with respiratory symptoms of COVID-19 infection. Pregnant women do not appear to be more susceptible than general population to the consequences of infection of COVID-19.<sup>[9]</sup> 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. Pregnant women, especially those with associated medical diseases (diabetes, asthma, 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/or gastrointestinal symptoms like nausea and diarrhea. Based on their clinical signs and symptoms, COVID-19-positive pregnant patients may be classified as having mild (clinical symptoms are mild and evidence of pneumonia on imaging), moderate (fever, respiratory distress, and radiological evidence of pneumonia), or severe disease (respiratory rate more than 30 breaths/min, oxygen saturation less than 93% at rest, PaO<sub>2</sub>/FiO<sub>2</sub> ratio of less than 300 mmHg, and more than 50% lesion progression on lung imaging within 24–48 h). Patients with respiratory failure requiring mechanical ventilation, presence of shock, or

other organ failure that requires intensive care management are considered to be critically ill.<sup>[9,10]</sup>

In patients with mild-to-moderate disease, supportive treatment is indicated, which includes rest, oxygen supplementation, judicious fluid management, and nutritional care and measures to allay anxiety. Pregnant patients are known to have a low functional residual capacity and increased oxygen consumption. Thus, they are known to develop hypoxemia rapidly. So consider early oxygen therapy in these patients and target oxygen saturations  $\geq 95\%$  and/or partial pressure of oxygen  $\geq 70$  mmHg.<sup>[9]</sup> Patients with severe disease and those who are critically ill need intensive care management. They may need invasive ventilation with lung protective ventilation strategies. There is little evidence on prone positioning in pregnant women. They may however benefit from being placed in the lateral decubitus position.

Mode and timing of delivery in a COVID-19-positive pregnant patient should be individualized based on clinical status of the patient, gestational age, and fetal condition. Royal College of Obstetricians and Gynaecologists (RCOG) advises that decisions regarding mode of delivery should be on obstetric indication and not on presumed protection of baby against infection.<sup>[11]</sup> It is essential to continuously assess both maternal and fetal status to balance the risk of prolonged labor versus cesarean delivery.<sup>[6]</sup> The second stage of labor should be cut short to prevent maternal exhaustion as well as to reduce maternal efforts, especially in cases where there is presence of respiratory involvement due to COVID-19 infection. Delayed cord clamping has not been advised in certain reports from China. However, RCOG is in favor of practicing delayed cord clamping as they argue that 1 min of further perfusion via the placenta is unlikely to impact the risk of vertical transmission. Though currently there is no evidence of vertical transmission from mother to fetus, however the data are limited.<sup>[9,11]</sup>

## Labor Analgesia in Patients with Active COVID-19 Infection Neuraxial Analgesia

Labor analgesia is best achieved with continuous labor epidural technique as per standard protocols using solutions of local anesthetics and opioids. Early epidural placement is desirable in a laboring patient as aerosol generation is greatly increased in patients with severe labor pains. Further, epidurals can be used if needed for operative delivery.<sup>[6,12,13]</sup> It is suggested that experienced anesthesiologists should be involved in placement of neuraxial blocks, as donning PPE makes the conduct of procedures difficult. All patients should be wearing N95 masks at all times. A platelet count is recommended to be done before the procedures as thrombocytopenia has been reported in patients with COVID-19 infection.<sup>[6,12]</sup>

**Entonox<sup>[6,14]</sup>**

Entonox as a modality for labor analgesia is not recommended in COVID-19-positive parturients requiring labor analgesia. Inhalation and exhalation of oxygen–nitrous mixture are likely to generate large amount of infected aerosols.

**Pharmacotherapy**

Medications recommended for use for labor analgesia are standard doses of opioids during early labor. However, the risk of respiratory depression, both in the mother and the delivered baby, is a distinct possibility and both should be monitored when such opioids are used. Conventionally, nonsteroidal anti-inflammatory drugs (NSAIDs) are not recommended for pain management in COVID-19 patients. NSAIDs may aggravate COVID-19 infection trajectory (although the evidence is not robust), as they are known to be associated with increased angiotensin converting enzyme-2, to which COVID-19 binds.<sup>[6,13]</sup>

**Anesthesia for Cesarean Delivery of COVID-19-Positive Parturient<sup>[6,15,16]</sup>**

Neuraxial anesthesia is the preferred technique for operative deliveries. No special recommendations have been made for the technique of spinal, epidural, or a combined spinal epidural technique for such parturients. A single shot spinal anesthesia with bupivacaine and fentanyl or morphine is suggested as a one-time approach that ensures prolonged postoperative analgesia for such parturients (itching, nausea vomiting, and urinary retention being the tradeoff for such a mixture). However, the techniques that are most commonly used in institutions should be practiced. There is no contraindication to use of transverse abdominis plane or other similar blocks for postoperative pain relief. If an indwelling labor epidural catheter is working, it may be dosed to provide surgical anesthesia. All precautions related to PPEs should be followed even if a rapid spinal anesthesia is required.

If general anesthesia is required, an experienced anesthesiologist should intubate the parturient. It is emphasized that the wearing of PPEs and related difficulties like misting/fogging of goggles can further increase the difficulty in intubation of such parturients.

There are many devices being advocated for use during intubation and extubation to decrease the exposure of the anesthesiologist to aerosols generated during such procedures. Individual comfort and familiarity is recommended prior to their usage. Simulation drills should be rehearsed by all the team members (after wearing PPEs) regularly.

A disinfection protocol for the reusable equipment should be in place as per discussion with hospital infection control board.

**Airway Management****Intubation**

Intubation can generate a huge amount of aerosol that can lead to exposure of the anesthesia team members to the exhaled virus. All members should be donning a proper PPE and a coach/buddy should ensure that there is no breach of sterility. For intubation, at least two persons are recommended and depending upon the difficulty a third may also be required. A protected (measures applied for personnel as well as patient) rapid sequence intubation should be performed, which should be done after preoxygenation, and maximal dose of neuromuscular blocking agents should be used to avoid coughing and bucking. Manual mask ventilation should be avoided as far as possible. The airway of a pregnant woman is deemed to be difficult and more so in COVID-19-positive patient. Therefore, it would be prudent to have an experienced anesthesiologist perform intubation.

Additional steps include placement of a high efficiency hydrophobic filter between the facemask and breathing circuit or between the facemask and reservoir bag, avoiding suctioning and ventilator disconnections. Wherever possible, closed in line suction system should be used. The correct placement of the ETT in the trachea is not possible by auscultation of the chest while wearing a PPE. Thus, capnography should be used to confirm the same. A second generation supraglottic airway device can be used for airway rescue, keeping in mind the increased amount of aerosols that can be generated if the seal provided by the device is inadequate. Use of aerosol-protective transparent acrylic boxes or clear plastic drapes is advocated.

**Extubation**

Extubation is a procedure which is more likely to result in aerosol generation due to coughing by the patient. At the time of extubation, minimum staff should be present in the operation room. All precautions to avoid aerosol contact should be adhered to. Suctioning through the endotracheal tube should be done with a closed in-line suction system. Extubating under acrylic transparent box or clear plastic drapes can limit the spread of contaminated aerosol. Extubation should be carried out after clamping the ETT. After extubation patient should be made to wear N-95 mask and oxygen through nasal cannula can be given from below this. All disposable items and soda lime should be discarded after extubation as per hospital infection policies.

## Management of Parturients Who Are Suspected Cases of COVID-19

The patients who report in labor and require expediting delivery prior to receiving COVID-19 test results should be treated as COVID suspects. While awaiting results, such suspects should be kept in isolation areas, specifically designated for them, while following all precautions as one would for a COVID-positive parturient. A dedicated OR and delivery suite for these patients will further enhance safety. Following delivery of these suspects, the further course of management will rely on the test reports. Till such time, these patients should be kept in isolation. In case the test results come positive, the patient should be sent to COVID ward/facility. Health-care workers should undergo quarantine and further management as per local policies.

## Cardiopulmonary Resuscitation

CPR remains a critical component of care, placing the rescuers at increased risk of exposure. The administration of CPR involves performing procedures that generate aerosols—chest compression, bag-mask ventilation, and intubation.

It is suggested that all personal protection precautions are undertaken by the health-care workers before administration of CPR. There are no special recommendations in the technique *per se* for administering CPR in a parturient with COVID-19 infection (all techniques and recommendations for parturients, including perimortem cesarean delivery, should be followed) other than ensuring safety of the administrator.<sup>[6]</sup>

It is strongly recommended that simulation-based training of administering CPR should be carried out in all health-care workers following donning of PPE.

Personnel on the scene should be limited only to those essential for patient care. Rescuers should consider replacing manual chest compressions with automatic mechanical devices if available. Ideally a HEPA filter should be attached in the path of any exhaled gas in manual or mechanical ventilation devices before administering any breaths. If intubation is delayed, a supraglottic airway or bag-mask device with a HEPA filter (High Efficiency Particulate Air' filter) may be used.<sup>[3,6]</sup> Following return of spontaneous circulation, the parturient should receive critical care support in the dedicated COVID-19 intensive care unit. Indications and the procedure for perimortem cesarean sections remain the same.

## Conclusion

The management of a COVID-19-positive parturient

during labor is described. The main issues that need to be ensured are personal protection of anesthesiologists, isolation of the patient—during labor and operative delivery, and simulation-based rehearsal of the procedures commonly carried out in the labor room and the operation theaters. It is also important to keep in mind that in the current rapidly evolving era of COVID-19, the management principles and guidelines are bound to change with each passing day.

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## Conflicts of interest

There are no conflicts of interest.

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