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Gergess A, Dagher C, Jabbour K, Madi-Jebara S. Anesthetic management of suspected or confirmed COVID-19 patients - A narrative review. *J Med Liban* 2020; 68 (1-2): 52-59.

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ABSTRACT • COVID-19 is a new pandemic crisis with potentially severe complications. This paper aims to define available data concerning optimal anesthesia management for patients with COVID-19 and to provide safety recommendations for healthcare professionals.

Keywords: COVID-19; airway management; pediatric anesthesia; obstetrics; cardiac surgery

RÉSUMÉ • La pandémie COVID-19 est une pandémie virale qui est potentiellement grave. À ce jour, les données sur la physiopathologie et le management de cette maladie sont limitées. Cet article vise à décrire la prise en charge anesthésique optimale des patients atteints de cette maladie et à donner des recommandations pour assurer la sécurité du personnel soignant.

Mots-clés: COVID-19; intubation; anesthésie pédiatrique; obstétrique; chirurgie cardiaque

INTRODUCTION

In December 2019, a novel coronavirus now known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was identified in patients in Wuhan, China. Infection with SARS-CoV-2 led to Coronavirus Disease 2019 (COVID-19). Rapid international spread of this potentially lethal virus has caused global concern, with millions of cases and thousands of deaths [1].

The SARS-CoV-2 virus has also reached Lebanon, affecting more than 1500 cases to date. Healthcare workers are exposed to a high risk of infection as they provide direct care to infected patients. Anesthesiologists are at an even higher risk than healthcare workers of other subspecialties; several anesthesiologists have been infected after providing tracheal intubation for confirmed COVID-19 patients [2] or even after spinal anesthesia for cesarean section [3]. Therefore, urgent development of safe medical practices and infection prevention protocols for the perioperative management of patients with COVID-19 is needed. To provide better care for COVID-19 patients and to plan practical and precautionary measures, this review describes anesthesia-related characteristics of patients with confirmed or suspected COVID-19 presenting for surgery.

ANESTHESIA PREOPERATIVE EVALUATION

Non-urgent surgical procedures should be canceled or postponed. In cases of urgent procedure, the preoperative assessment should aim to identify high-risk patients

and procedures, as well as to optimize patient's condition mainly focusing on reinforcing the patient's respiratory status.

- Assess airway carefully, allowing a management plan to be developed ahead.
- Evaluate the severity of respiratory compromise based on arterial blood gas, oxygen requirements, and chest X-ray changes or CT scan.
- Evaluate major organ systems such as cardiac, liver, and renal. Look for signs of shock and organ failure.
- Review current antivirals to avoid drug interactions with anesthetic medications [4].
- Determine postoperative need of the patient for intensive care support.
- Oral Midazolam should be avoided as a premedication agent in patients receiving antiviral drugs [4].

PERSONAL PROTECTIVE EQUIPMENT FOR HEALTHCARE PROFESSIONALS

It is of utmost importance to protect healthcare workers from infection. All healthcare professionals must be provided with personal protective equipment (PPE) to prevent droplet, contact, and airborne infections. PPE items consist of: long-sleeved fluid-repellent gown; fit tested and fit checked high filtration mask such as FFP2 (N95) mask; goggles or visor; disposable gloves (consider double gloves for the anesthesiologist performing the intubation); disposable hat and shoe covers [5-9].

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Institutions and medical staff should establish procedural protocols for donning and doffing PPE to avoid self-contamination, and training in the use of PPE is required for all staff involved in suspected or confirmed COVID-19 cases. Furthermore, hand hygiene should be performed in every step of PPE removal according to the hospital guidelines.

Ahead of the procedure, the anesthesia team should be given enough time for donning and full respect of safety measures need to be implied [2]. A complete check should be done including a self-check and, more importantly, a check by another colleague [10].

PATIENT TRANSPORT TO THE OPERATING ROOM

- The transfer of a confirmed or suspected COVID-19 patient to any intervention and return to an isolation room should be planned due to the risk of aerosolization.
- COVID-19 patient transportation, in the pre- and post-operative setting, should be done through a dedicated pathway. Disinfection needs to be regularly done [11].
- Corridors and elevators should be kept free.
- Take only the elevator dedicated to COVID-19 patients.
- Patients who do not require intubation before transport to the OR must wear a surgical mask.
- If the patient is intubated, it is recommended to use a ventilator during transfer with a high-efficiency particulate air (HEPA) filter inserted between the bag-valve-mask breathing device and the patient [12]. Moreover, it is preferable to cover the patient during the transport process with a transparent disposable plastic sheet [13].
- Healthcare professionals responsible for the transfer process should wear PPE.
- Hand disinfection should be done with hydroalcoholic solution before and after each contact with the patient [14].
- The surfaces of passageways and the elevator should be disinfected once the transport is done [11].

ANESTHESIA MANAGEMENT FOR ADULT PATIENTS

General considerations

- The dedicated operating room (OR) and anteroom should be equipped with a negative pressure system, and an appropriate level of negative pressure must be ensured [15]. In a hospital where negative pressure operating rooms are unavailable, the positive pressure system and air conditioning must be turned off [2].
- Warning signs for COVID-19 infection should be displayed on the door of the OR to minimize staff exposure.

- Only personnel involved in direct care are allowed to enter the allocated OR.
- An anesthesia machine is dedicated to the designated OR.
- A breathing circuit filter (HEPA filter) must be installed between the proximal end of the endotracheal tube (ETT) and the distal end of the circuit. An additional filter (HEPA) must be applied between the breathing circuit and the expiratory valve [12,13,15]. It is recommended to replace the filters after every COVID-19 positive patient and after every 3 to 4 hours of anesthesia use [2].
- A closed-loop aspiration system is highly recommended to avoid disconnection while suctioning the patient via the ETT [11].
- Before initiating any airway management, the airway strategy (primary plan and rescue plans, and when they are progressed to) should be set up and the airway team briefed. Use a cognitive aid if difficulty arises.
- All necessary equipment for airway management should be prepared and readily available before starting anesthetics. This preparation reduces the need for clinicians to reach into the anesthesia workstation drawers and bins once the patient has entered the procedure room. Use a tracheal intubation checklist [16].
- Aerosol box, if available, can provide additional protection during intubation and extubation [17,18].
- Trash cans and sharps containers should be readily available and open to avoid dropping equipment on the floor, which increases viral dispersion [16].
- For anesthesia drug dispensing workstations that require touching the screen, a plastic shield should be placed over the screen to minimize contamination [19].
- Clinicians should leave badges, keys, cell phones, pagers and pens outside the OR. Emergency phones may be kept in sealed bags to facilitate communication with other clinicians.
- Limit the number of health care providers while intubation is taking place. Three individuals are likely required to be present inside the OR to directly manage the patient: an intubator, an assistant, and a third person to administer drugs and watch monitors. A runner should be available outside the OR serving as a backup.
- In-situ simulation is vividly recommended to enable staff to familiarize themselves with PPE use and the management of resuscitation of COVID-19 patients [20]. In Lebanon, many videos were uploaded concerning anesthesia management for COVID-19 patients.
<https://www.youtube.com/watch?v=PH6RiVmBSn0>
<https://www.youtube.com/watch?v=CLJGHsDs3Jg&feature=youtu.be>

Types of anesthesia

Different types of anesthesia can be selected dependent on the type of surgery and individual patient's need.

General anesthesia (GA) with airway instrumentation in COVID-19 patients creates a risk to physiologically compromised patients and to attending healthcare providers, both during intubation and extubation. Healthcare professionals are 6.6 times more exposed to respiratory secretions during tracheal intubation compared to those kept away [21]. It is important to perceive that the use of tracheal intubation is preferable to the laryngeal mask. Furthermore, regional anesthesia (RA) has fewer effects on respiratory function and dynamics compared with GA. This could reduce postoperative pulmonary complications in COVID-19 patients who may already have decreased respiratory function from COVID-19-associated pneumonia or acute respiratory distress syndrome.

Subsequently, RA should be preferred over GA in managing these patients whenever possible [22-24].

General anesthesia for COVID-19 patients

Induction

- Induction must be initiated after a complete satisfactory check of PPE for every person in the OR.
- Standard monitoring, intravenous (IV) access, instruments, drugs, ventilator, and suction should be pre-checked.
- Airway management must be carried out by the most experienced senior to maximize first-pass success [2,12-13].
- It is recommended that rapid sequence induction (RSI) should be used, and appropriate preparation for RSI should be similar to that of an ordinary patient.
- Aerosol-generating procedures should be avoided. This includes high-flow nasal oxygen, bag masking, noninvasive ventilation, and awake fiberoptic intubation [25,26].
- Meticulous preoxygenation for 3 to 5 minutes, with 100% oxygen, should be performed with a well-fitting mask. A closed-circuit is optimal and is preferable to a bag-mask. The anesthesia mask should be adjusted with both hands to minimize leakage [2,11-13].
- If RSI is impossible or undesirable, provide mechanical ventilation using either pressure or volume-controlled ventilation mode; PCV or VCV mode respectively, with small tidal volumes, positive end-expiratory pressure (PEEP) at 5cmH₂O with 100% oxygen [11-13,20].
- At all times, gas flow rates should be kept low < 6 ml/min while maintaining oxygenation [20].

General anesthesia drugs

It has been demonstrated that drug interactions between antiviral drugs (particularly Kaletra®-Lopinavir/Ritonavir) and anesthetic agents are common. However, it is noteworthy that no clear contraindications have been recommended for the use of any IV anesthetic or analgesic drug [4].

Intubation

- After induction, ventilation is stopped before removing the mask.
- The most experienced anesthesiologist available should perform the intubation. Using a videolaryngoscope with a separate screen allows the intubator to stay distant from the airway. Sufficient muscle relaxation should be obtained to prevent coughing during intubation [2,11-13,27].
- Remove the outer gloves immediately after completion of intubation.
- The endotracheal tube cuff should be inflated with air to a measured pressure of 20-30 cmH₂O before initiating mechanical ventilation.
- A regulation system balloon's pressure is to be put in place to avoid leaks.
- A closed airway suction system, if available, is recommended to reduce viral aerosol production [25,28].
- Vigorous intubation using the fiberoptic should be avoided unless specifically indicated due to the risk of cough when spraying the local anesthetic, which promotes the dispersion of aerosols [21].
- If disconnection is necessary: stop the ventilator before disconnecting, then clamp the ETT.

Recovery from anesthesia

- Once the patient meets the criteria for extubation, he or she should be extubated in the OR. Patient coughing should be minimized, thus reducing the risk of exposure to droplets and aerosols at this time.
- Since SARS-CoV-2 virus can be spread through nausea and vomiting, prophylactic antiemetics such as 5-hydroxytryptamine receptor antagonist (Ondansetron®) can be given postoperatively [29]. However, the administration of Dexamethasone and NSAIDs remains controversial [30,31].
- The staff present is placed behind the patient's head.
- The weaning of the respirator will be carried out in PSV-Pro (Pressure Support Ventilation-Protect) or spontaneous manual mode.
- All necessary equipment for oxygen delivery via mask or low flow (< 5 l/min) nasal cannula should be prepared before extubation [32].
- Undertake appropriate tracheal and oral suction with a closed suction system before extubation [28]. The balloon is then deflated.

- After extubation, place immediately a surgical face mask on the patient above his/her oxygen mask or nasal cannula.
- After the procedure, all material used for ventilation and intubation is discarded or disinfected promptly with a standard disinfectant detergent. After disinfection, the anesthesia machine can be used for other non-COVID-19 patients; and no cross-infection has been reported so far. The carbon dioxide absorber is recommended to be replaced between cases [2].

Regional anesthesia (RA) for Covid-19 patients

- RA should be preferred over GA for delivering anesthesia care whenever possible. It should be performed by the most experienced anesthesiologist [33].
- Thrombocytopenia needs to be ruled out before neuraxial procedures [34] as well as abnormality in INR and PTT values.
- Nerve blocks that have minimum impact on respiratory function are privileged such as axillary or infraclavicular brachial plexus block and risk-benefit should be considered for perineural adjuvants and continuous perineural catheters. Currently, no dose adjustment for RA is recommended [22,33].
- Patients should keep the surgical mask [35].
- The sedation dose needs to be decreased; hence respiratory compromise requiring supplemental oxygen is avoided. To reduce the risk of aerosolization, the oxygen mask or nasal cannula should be applied under the surgical mask and the oxygen flow needs to be minimized while maintaining adequate oxygen saturation.
- Ultrasound guidance is required for peripheral nerve blocks and plastic covers should be used to protect ultrasound equipment [22].
- Before starting the surgery, RA should be thoroughly tested to avoid unplanned conversion to GA.

It is recommended that patients should be sent to an isolation room or ICU after surgery, bypassing the Postanesthesia Care Unit (PACU). [33]

ANESTHESIA MANAGEMENT FOR PEDIATRIC PATIENTS

According to different cohorts of COVID-19 patients, children seem to be less affected by this virus. In Lebanon, the Ministry of Health reported to date that, in this pathology, 1.34% of patients are less than 10 years old and 6.99% are between 10 and 19 years old [36].

More than one fourth (27%) of laboratory-confirmed COVID-19 positive children are asymptomatic and relatively few of them are hospitalized [37-39].

Critical cases are rare in this population, but infants seem to be vulnerable since death was reported in infants [37].

Though in general, children seem to be relatively protected from the severe pulmonary complications due to this infection, they are one of its main vectors and during this pandemic season, special care should be taken by anesthesia teams in this regard.

The OR workflow will be the same as for adult patients. Children, except neonates, should wear a surgical face mask on their way to the OR.

In order to avoid vigorous crying and the need for physical restraints, the routine use of preprocedural sedatives to reduce anxiety is highly recommended. This will help increase compliance when an IV line is placed while awake [16].

Parents in the OR are not welcomed under these circumstances.

It is advisable to avoid non-rebreathing circuits [25].

It is highly recommended to perform an IV anesthesia with a RSI. Otherwise, a modified rapid sequence is preferred; effort should be made to rapidly put an IV line and to control the airway. The most experienced anesthesia professionals available should be behind the patient. Manual, pressure support or controlled ventilation could be considered with small tidal volumes (just enough to rise the child's chest wall) before intubation, but fresh gas flow should not exceed 6 L/min and 3 L/min for children whose weight is < 10kg [16].

Intubation should be made using videolaryngoscopy. Supraglottic devices are contraindicated [40].

The aim is to perform intubation and extubation as safely as usual and to avoid any coughing, agitation, or dispersion of secretions in the atmosphere. Therefore, the usage of a muscle relaxant could be considered or intraoperative clonidine or dexmedetomidine and antiemetics.

Extubation is a very delicate step: careful suction of the oropharyngeal cavity should precede either deep or awake extubation, trying to avoid cough and vomiting. Some teams consider extubating under a transparent plastic drape acting as a physical barrier against aerosolization of the patient's secretions [41]. An oxygen mask should be placed on the patient face and a surgical mask added over it after extubation.

Once the child is fully awaked, he will be directly transferred to the inpatient ward or the ICU bypassing the PACU [16, 42].

NON-OPERATING ROOM ANESTHESIA

All elective procedures during the COVID-19 outbreak should be deferred, especially endoscopic procedures. Because the infection is transmitted through inhalation of airborne droplets, conjunctival contact, and touch and feces contamination, optimal precautions must be used

to prevent the infection of healthcare providers in endoscopy units [43-47].

- Patients need to be assessed and COVID-19 risk stratification has to be performed one day before scheduled endoscopy (preferably by phone) and on the day of the procedure [44, 48].
- Family members and accompanying persons should not enter the endoscopy unit [49].
- All patients undergoing endoscopic procedures should wear a facial mask whenever possible [49].
- Procedures would be better performed in a negative pressure room – inside the OR – and all general precautions mentioned above should be used [50].
- ICU patients should not be transferred for gastrointestinal (GI) endoscopy. Thus, a bedside GI endoscopy should be performed.
- Urgent or semi-urgent procedures should be performed by an experienced medical team. The number of staff should be kept to a minimum and wear the appropriate PPE.
- To prevent airway manipulation, RA should be performed wherever possible [47,49].
- Prefer GA with intubation to secure the airways and prevent aerosolization [51].

ANESTHESIA FOR OBSTETRIC PATIENTS WITH SUSPECTED OR CONFIRMED COVID-19

Anesthesiologists could take care of these parturients either in the delivery room or in the OR; some may be asymptomatic and others may be in a very critical state.

General precautions to be adopted in the delivery room

- A negative pressure room – if possible – should be designed for labor and delivery and the number of medical and other attending staff minimized in the dedicated room.
- The caring medical team should wear the appropriate PPE while the patient wears a surgical face mask during labor and delivery.
- Clinical surveillance of the parturient is necessary to monitor any aggravation of the clinical state (hyperthermia, dyspnea, etc.) that might necessitate intervention or change of delivery mode. Routine monitoring should include frequent vital signs with the addition of continuous pulse oximetry and strict input and output measurements to assure fluid restriction. Pulse oximetry goal should be an oxygen saturation $\geq 95\%$.
- Dedicated trays (or carts) containing the most commonly used supplies and drugs for neuraxial labor analgesia should be available, to minimize traffic and contamination of anesthesia workstations and other anesthesia equipment [52].

Hemostasis assessment

- Make a hemostasis assessment upon arrival at the hospital: CBC, INR, PTT, fibrinogen, and D-dimers. In case an anomaly is detected, complete with the usual explorations [53].
- It should always be associated with the search for a hemorrhagic diathesis suggestive of a hemostasis disorder (HEMSTOP Score) [53].
- If the patient is taking low-molecular-weight heparin (LMWH) for thromboprophylaxis, dose and timing should be noted to manage any neuraxial analgesia or anesthesia.
- If maternal COVID-19 infection is severe with high values of fibrinogen and D-dimers (fibrinogen > 8 g/l; D-dimers > 3 g/ml) management should be discussed with the patient's gynecologist. The concentration of D-dimers can be greatly increased in pregnant women infected with COVID-19 without diagnostic or prognostic value for pulmonary embolism. If in doubt, other diagnostic methods such as an injected computed tomographic scan (CT scan) should be considered [52].

Analgesia for labor and delivery

COVID patient without signs of seriousness

Early epidural placement is desirable to avoid exacerbation of respiratory symptoms with labor pain, and to reduce the likelihood of GA if cesarean delivery becomes needed [52].

The risks of performing neuraxial analgesia are minimal, even absent since COVID-19 virus gives little or no viremia and no neurological damage has been observed with this virus. To this date, no particular problem has been reported with epidural analgesia such as hyperthermia cases which may be associated or promoted by the use of epidural analgesics [54-59].

The risk of COVID-19 exposure for the anesthesiologist during neuraxial labor analgesia placement is presumably low since this is not an aerosol-generating procedure; nevertheless, Zhong et al. [3] reported transmission of COVID-19 – confirmed by PCR – from patients having spinal anesthesia for cesarean section to 57.1% of anesthesiologists who were wearing category 1 PPE's limited to surgical mask, hat, gloves, and gowns. So for the time being, the proposal is not to modify the indications and analgesia practices in patients with little or no symptoms.

The decision of the management technique is the sole responsibility of the anesthesiologist. We suggest performing an epidural analgesia in the early stage of labor; either epidural or combined spinal-epidural analgesia in case of cervical dilatation > 6 cm; and spinal analgesia in case of a complete cervical dilatation or planned baby extraction in less than 60 minutes.

In case of failure of epidural analgesia or in case of insufficient epidural avoid N_2O and prefer RA.

In case of a patient with signs of severity

If the patient's status worsens during labor with signs of increasing severity (fever, respiratory distress, etc.), management will be discussed on a case-by-case basis between the anesthesiologist and the gynecologist. At the same time, obstetric care and resuscitation will be carried out [60-62].

In case an intubation is urgently required, a cesarean section will be made after intubation unless the fetus can be extracted within minutes.

In the event of a dural breach, similar to usual care, conservative measures should be initially provided. Postponing the epidural blood patch is recommended in women who are actively ill. Individual assessment of the benefits and risks should be assessed and shared decision-making should be engaged with the patient prior to proceeding [55].

Cesarean delivery per se

The cesarean delivery has to be performed in a negative pressure OR designed to accommodate COVID-19 patients. The presence of the spouse is prohibited in the OR.

GA has to be avoided unless neuraxial anesthesia is contraindicated. A publication from Wuhan, China, describing outcomes in 17 cesarean deliveries concluded that "excessive hypotension" occurred in 12 of 14 cases within comparison with three women who received GA; however, information about the blood pressure trends and description of the use of vasopressors were not reported. Another study suggested that SARS-CoV-2 can bind with the angiotensin-converting enzyme II (ACE2) receptor, which could explain partly the significant hypotension observed with COVID-19 positive women treated via neuraxial anesthesia.

The key to SARS-CoV-2 infection is its S protein binding with ACE2 receptor [59].

Spinal anesthesia administered in 49 patients (45 cesarean deliveries and 4 orthopedic procedures) was well-tolerated with stable blood pressure [3]; but the authors did not give any details about intraoperative blood pressure or vasopressors needed. Anesthesiologists should be aware of this risk and be ready to treat it.

Antiemetic medication should be administered to lower the risk of vomiting and viral spread. Although NSAIDs and dexamethasone seem to play a potential role in the treatment of COVID-19 patients, their use remains controversial [30].

Postpartum thromboprophylaxis

Given the absence of solid data and the significant thrombotic risk of this disease, postpartum thromboprophylaxis should be discussed on a case-by-case basis. It is however, strongly advised to put prophylaxis to all parturients whatever the delivery route and the personal risk factors [60-62].

Clinical management of patients undergoing cardiac surgery is complex, and the cardiac anesthesiologist is faced with many challenges as these patients present with multiple comorbidities. Furthermore, perioperative hemodynamic management usually requires invasive monitoring. In patients with COVID-19 this might be associated with even greater challenges for the cardiac surgery team. Therefore, non-urgent cardiac surgeries should be delayed until COVID-19 virus screening tests are negative.

General considerations

- All necessary equipment including anesthesia machines, monitors, ultrasound machines, activated-clotting time (ACT) machines, blood gas, and transesophageal echocardiography (TEE) probes should be prepared and checked in advance in the OR.
- Ultrasound guidance for central venous and arterial catheterizations is highly recommended since it reduces procedure time and improves the success rate.
- Monitoring and optimization of cardiac output (CO) are central components of perioperative hemodynamic management in these patients. PiCCO, TEE, Swan-Ganz catheters, and other advanced monitoring are recommended to assess the need for inotropic or vasoactive drugs and guide fluid management. In addition, patients with acute myocardial injury should be considered for early intra-aortic balloon pump, ventricular assist device, or ECMO mechanical circulatory support [63].
- COVID-19 patients may have abnormal coagulation function. Therefore, platelet counts, prothrombin time (PT), international normalized ratio (INR), and partial thromboplastin time (PTT) should be regularly evaluated. Multiple blood conservation strategies such as preoperative hemodilution, antifibrinolytic medications, intraoperative blood salvage, mild hypothermia or normothermia during cardiopulmonary bypass, and autologous platelet-rich plasma technology are required to reduce blood transfusion and decrease transfusion-related lung injury.
- At the end of the procedure, the patient is left intubated. He is then transferred to an airborne isolation ICU room through a designated pathway. A HEPA-equipped portable ventilator should be used during the transfer.

CONCLUSION

Although to date many questions remain to be answered concerning the exact pathophysiology and therapeutic approach for the COVID-19 pandemic, this manuscript provides available data for both anesthetic management as well as healthcare professionals' security in this setting.

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Faysal EL KAK*

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Towards the end of 2019, in December, a new strain of coronavirus was identified in Wuhan, China, and found to cause severe acute respiratory syndrome (ARDS). The virus, known as novel coronavirus, was later named SARS-CoV-2, being one of seven coronaviruses, mostly close to SARS and MERS coronaviruses.

The WHO announced a name for the new coronavirus disease: COVID-19, and declared it as Public Health Emergency of International Concern. At the time of writing this manuscript, there are 4 589 526 confirmed SARS-CoV-2 positive cases and close to 310 391 death in 216 countries and territories [1]. Globally, countries went into staged precautionary measures to prevent spread of the outbreak [2]. In February 21, 2020, Lebanon identified its first case and immediately Ministries, Government bodies, and several agencies began a COVID-19 public health and awareness campaign along with escalated measures towards a state of medical emergency (banning travel from epidemic countries, closing schools/shops/malls/others up to a state of curfew) [3].

National efforts focused on flattening the curve of outbreak spread to avoid health system collapse in view of the limited number of beds, including intensive care beds, and the specificity of Lebanon demographics in relation to Syrian and Palestinian refugee camps and crowding, as well as the clinical course of COVID-19.

In a report from China on more than seventy thousand cases with COVID-19 disease [4], 19% of the cases had a disease spectrum from severe to critical with pneumonia being a major cause of maternal morbidity and mortality. WHO reports showed a mortality rate of 3%-4% [5], but with higher rate of patients requiring admission to the intensive care unit (ICU) [6]. The overwhelming and vast global spread of COVID-19 has raised concerns about its impact on pregnancy and childbirth, including

neonatal health. Lebanon has an estimated population of pregnant women of around 125.000 Lebanese and non-Lebanese [7] that demands special attention, information, and guidance from health care providers, namely the obstetricians and gynecologists (OBGYN). Although international guidance consensus indicates that pregnancy is not a particular high risk event to COVID-19 [8], the physiologic changes during pregnancy are known to predispose pregnant women to worst outcomes with viral pneumonia, including higher rates of hospitalization [9], with consequent higher maternal and neonatal morbidity and mortality [10-11]. To our knowledge, data looking at the effect of COVID-19 disease on pregnancy remains limited which makes both counseling and management of these patients cautious and conservative. In this respect, comparisons were made with two other global outbreaks of highly-pathogenic coronaviruses: severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). Although SARS-CoV-2 is not identical to SARS and MERS, it shares some genetic structures and clinical manifestations in relation to pregnancy course and outcome. Data from the limited literature on SARS and MERS in pregnancy revealed cases of severe disease requiring need for intensive care admission [12-17]. Maternal mortality cases associated with SARS and MERS infection were reported. Comparing pregnant to non-pregnant outcomes with SARS infection in one case-control study showed that pregnant women with SARS disease had worst outcomes [18].

Globally, the community of OBGYN has been made responsive by the proactive response of the International Federation of Obstetrics and Gynecology (FIGO) in compiling resources, launching training webinars, and issuing statements related to COVID-19 outbreak in pregnancy, gynecologic oncology, essential sexual reproductive health services, and elective surgeries [19]. In specific, FIGO issued one of the earliest statement on COVID-19 and pregnancy that was contributed to by its vice president, the chair of the safe motherhood committee, and other experts from FIGO federations, highlighting priorities in dealing with pregnancy and maternal health care during the outbreak and in building the skills of OBGYNs to respond to it. FIGO aimed to reach its 132 national member societies which might have varied response and preparedness to COVID-19 pandemic depending on their resources and logistical preparations, more so in low and

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middle income countries (LMIC). Moreover, FIGO like other global agencies is adamant on ensuring interruption or delay to essential services that are mainly related to family planning and contraceptive methods, abortion (when legally allowed), post-abortion care, and identification and management of survivors of violence. There is an ongoing collaboration between FIGO and WHO to implement self-care guidelines whenever possible around services like contraception, cervical cancer screening self-test, dysmenorrhea, menopausal therapy, and counseling survivors of violence.

Lebanon was not also any different for early responders to COVID-19 and pregnancy. Considering potential risk of SARS-COV-2 on pregnancy, and aiming to protect pregnant women from the pandemic, the Ministry of Public Health in Lebanon (MOPH) formed a National Technical Committee on Corona and Pregnancy, the only specialized committee in the region, with the main aim to prevent COVID-19 outbreak among pregnant women and to raise professional and public awareness on COVID-19 and pregnancy. This aim presents a challenging priority to Lebanon in the presence of close to 50 thousands or more pregnant non-Lebanese women [20] spread across urban and camps settlements, with different patterns of antenatal care and suboptimal compliance with visits and supplement intake [21]. The Committee, chaired by Dr Faysal El Kak, included chairpersons (or their representatives) of the six main academic universities with teaching medical centers, the president of the Lebanese Society of OBGYN (LSOG), Director of the National Program on Mental Health, President of the Lebanese Order of Midwives, UNFPA, and representatives from the MOPH. The Committee was mandated to prepare response of health care providers (HCPs) to COVID-19 and pregnancy.

Over 10-12 weeks, the Committee achieved several tasks that included: Developing awareness and advocacy material on various aspects of COVID-19 and pregnancy (Pregnancy risk, breast-feeding, vertical transmission, protection measures, birth spacing, etc.) which were posted on social platforms and distributed to around 250 hospitals and primary health care centers all over Lebanon. The Committee members also developed clinical protocols and algorithms related to outpatient and inpatient management of pregnancy care and childbirth which was based on diverse global guidelines and adapted to the Lebanese context, and made available in Arabic, English, and French to OBGYNs and HCPs, as well as posted on the MOPH website, and on the International Federation of Gynecology and Obstetrics (FIGO) website (the Arabic version). Following that, a series of 12 training webinars were delivered in collaboration with the CME office at the American University of Beirut Medical Center (AUB-

MC) that provided CME credits and certificate of attendance. The webinars were expected to reach close to one thousand participants in Lebanon and the region, and were instructed also in Arabic, English, and French. The webinars aimed to build the knowledge and skills capacity of service providers.

Looking at cases of COVID-19 in pregnancy revealed a report of only one case that presented to a hospital in the North of Lebanon. On presentation she had a low grade fever and her accompanying husband had suspicious symptoms. She was transferred to another hospital in the same area, and was considered a person under investigation (PUI), and was tested for SARS-COV-2 before delivery by cesarean section under precautionary measures with the medical team donning personal protective equipment (PPE). The newborn was healthy with good Apgar scores, and was separated temporarily from the mother, transferred to regular nursery and tested for SARS-COV-2. One day postpartum, the coronavirus test of the mother came positive, and that of the newborn came out negative. On the second day postpartum, the mother and newborn were discharged home with full isolation precaution instructions.

The fact that there is one documented case of COVID-19 in pregnancy might be related to the early precautionary actions taken by the Government, the intense health promotion addressing pregnant women urging them for self-isolation and lockdown, as well as the OBGYN community response to modifying antenatal care using telehealth. However, there is a strong global argument on universal screening of all pregnant women as they are a category more susceptible to respiratory illness complications [22]. In another study looking at 43 COVID-19-positive pregnant women over a period of 2 weeks, 33% infected women were often asymptomatic, supporting a role for universal testing upon admission to labor and delivery [23]. In a letter to the editor of the *New England Journal of Medicine* on universal screening, it was reported that out of 33 SARS-CoV-2 positive pregnancies on admission, 29 of them (87.9%) had no symptoms [24]. Universal screening of pregnant women depends on the degree of the pandemic spread and on the available funds and resources in a given setting. In Lebanon, universal screening is not affordable, especially that the current reporting of cases indicates successful containment of the outbreak. Nevertheless, precautionary measures of testing, isolating, and tracking should continue to avoid the second wave of the pandemic, and this of course includes pregnant women.

COVID-19 pandemic represents a global crisis that goes beyond health and health systems. Health care providers have been challenged and threatened as frontliners and one-liners at times, and OBGYNs managing

pregnancy and childbirth have to learn a lot about protecting themselves and the pregnant women. The Lebanese OBGYN community and other health care professionals (HCPs) are expected to continue seeking available resources of the National Committee on Corona and Pregnancy regarding modifications of antenatal care, special considerations in intrapartum and postpartum care, breastfeeding, and provision of long acting reversible contraceptives, as well as PPE for the protection of the much needed health personnel.

Disclosure

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