

## ORIGINAL RESEARCH

## OBSTETRIC ANESTHESIA

# Anesthesia experience, clinical characteristics and outcomes of COVID positive childbirths during COVID-19 pandemic: an observational study at two teaching hospitals in Iran

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## ABSTRACT

**Background & objectives:** COVID-19 pandemic affected people all around the world since its first notification in 2020. The virus also affected pregnant ladies as well as their neonates. We aimed to accumulate data and report the clinical characteristics and outcomes of COVID-19 childbirths in two teaching hospitals during the pandemic.

**Methodology:** We retrospectively extracted data of COVID-19 infected parturients and their newborns at the time of delivery from electronic record system of the two target hospitals.

**Results:** Electronic records of 44 parturients, known to have COVID infection, and delivered in two hospitals. Out of them, 21 were on medication for the viral infection and 26 needed supplement oxygen. Six patients gave birth naturally and 38 had cesarean section to deliver. Rate of cesarean section and preterm labor was 81.81% and 31.81% respectively. Out of 36 patients who underwent cesarean section, 28 initially had spinal anesthesia.

**Conclusion:** COVID-19 infection increased risk of preterm labor; however, Covid itself did not affect the mode of delivery and type of anesthesia. The most important lesson of covid was real time sharing of vital data.

**Keyword:** Covid19; Pregnancy; Cesarean Section; Complications

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## 1. INTRODUCTION

Severe Acute Respiratory Distress Syndrome (SARS) virus was first isolated in Wuhan (China), and it soon spread all over the world causing a wide spectrum of symptoms.<sup>1</sup> World Health Organization announced coronavirus disease to be a pandemic on March 11, 2020.<sup>1, 2</sup> Our country was also affected by this pandemic.<sup>3,4</sup> However, not all the infected people experienced the same issues; many of them remained asymptomatic, while others experienced a tragic course of the disease.<sup>5</sup>

The maternal physiologic changes during normal pregnancy include a hypercoagulable state, changes in cardiovascular system, reduced functional residual capacity of the lungs and increased oxygen demand; and make the parturient with COVID-19 a special concern and a major challenge to the healthcare system due to the unknown and new nature of the disease.<sup>6,7</sup>

As we know to date, COVID-19 infected mothers and their neonates have increased morbidity and mortality.<sup>7,8</sup> Presence of comorbidities and ethnic variations affect severity of COVID-19 infection and those with severe symptoms were at increased risk of peripartum morbidity.<sup>8, 9</sup> Spontaneous preterm labor rates and stillbirths raised during the pandemic to 21-40%.<sup>10,11</sup> There are also some concerns regarding placental damage due to direct impact of COVID-19 which remains to be confirmed.<sup>12,13</sup>

During the early months of pandemic, a major challenge was determining the optimal time for terminating pregnancy and identifying the choice of delivery specially in symptomatic parturients. The most important challenge for the anesthesiologists was to choose the best anesthetic approach for cesarean section. Another challenge was to identify whether the virus can be transmitted during natural vaginal delivery; but to date there is no evidence of such transmission although some reported that fetuses might be infected by intrauterine transmission.<sup>14</sup> Because of limited information about anesthesia and perioperative management, the delivery modes, maternal and neonatal clinical features and outcomes of parturients with positive COVID-19 at the time of delivery in this part of the world, we present our experience with these issues in this group of patients.

## 2. METHODOLOGY

This retrospective observational study was conducted in Taleghani and Imam Hossein Educational Hospital affiliated to Shahid Beheshti University of Medical Sciences in Tehran, Iran, during COVID-19 pandemic between February 2020 until March 2022. The study was

approved by the Ethics Committee of Vice-Chancellor in Research Affairs, Shahid Beheshti University of Medical Sciences in Tehran, Iran on November 13, 2022 (Approval ID: IR.SBMU.RETECH.1401.555). All data regarding COVID-19 infected parturients at the time of delivery was obtained from their electronic medical records.

Inclusion criteria was parturient who had positive COVID-19 PCR test or fulfilled computed chest tomography criteria for COVID-19 just before delivery. Those who were confirmed to have infection after delivery and those who had covid during pregnancy and recovered before delivery were excluded.

Demographic data of the mothers and neonates, symptoms and course of the disease, vital signs during admission, oxygen saturation, treatment received for infection, need for oxygen supplementation, mode of delivery, anesthesia technique for cesarean section, length of hospital and intensive care unit (ICU) stay and their final outcome were collected. Data was analyzed by SPSS software version 26.0.0.0. Continuous data were expressed in mean  $\pm$  standard deviation, while categorical data were expressed in numbers and percent.

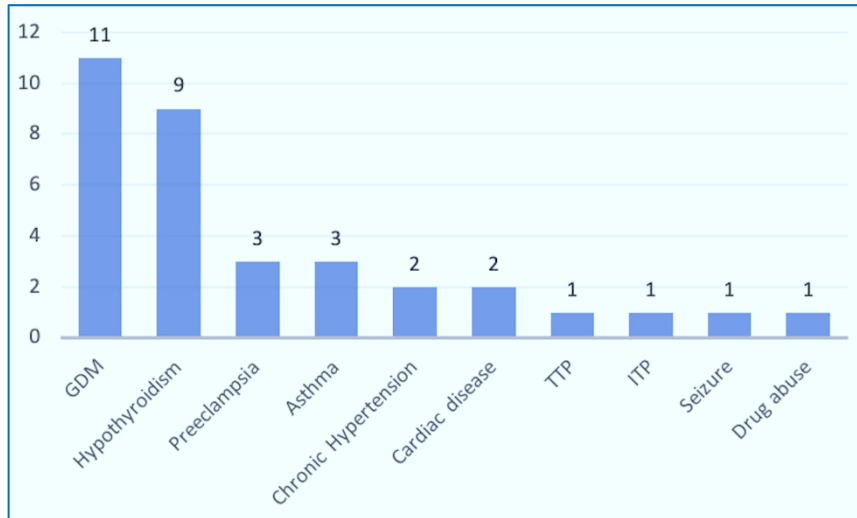
## 3. RESULTS

Data regarding 44 pregnant women meeting our study criteria was obtained. Mean age of participants was  $31.35 \pm 6.02$  y, the youngest being 17 y old and the eldest 41 y. Other demographic features are presented in Table 1. The most common maternal comorbidities as shown in Figure 1 were gestational diabetes and hypothyroidism.

**Table 1: Demographic features of the parturients**

Demographic variables	Mean $\pm$ SD
Age (y)	31.35 $\pm$ 6.02
Weight (kg)	79.38 $\pm$ 21.30
Height (cm)	160.48 $\pm$ 5.49
Body Mass Index (kg/cm <sup>2</sup> )	33.43 $\pm$ 10.57
Gestational age (week)	35.32 $\pm$ 4.50

Six of the parturients were asymptomatic; the most frequent symptoms were cough, dyspnea and fever (Figure 2). About half of the patients (47.7%) were treated for coronavirus infection based upon the National guidelines of the time, while 23 (52.27%) did not receive any specific medication. Infection treatment was not postponed until delivery and was initiated according to mother's condition. Of 44 patients, 26 patients were in need for oxygen supplementation; 3 received oxygen via



**Figure 1: Frequency of maternal comorbidities** (GDM - Gestational Diabetes Mellitus; TTP - Thrombotic Thrombocytopenic Purpura; ITP - Idiopathic Thrombocytopenic Purpura)

nasal cannula, 8 via face mask and 5 via non-rebreather mask. Ten patients needed more advanced methods of ventilation support; non-invasive ventilation was initiated for six patients, three of whom intubated as their disease progressed. Moreover, four patients had to be intubated due to respiratory failure; one of whom was intubated before delivery. One cesarean delivery was done during cardiopulmonary resuscitation in ICU.

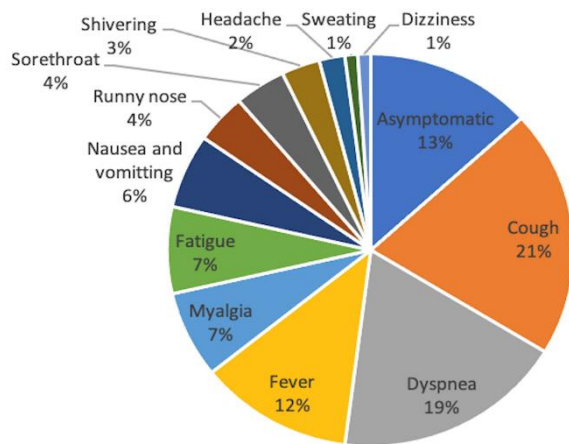
Out of 44 deliveries, 6 (13.63%) had natural vaginal delivery (3 were asymptomatic, 2 had mild symptoms and 1 had more severe symptoms) and 38 patients underwent cesarean section, out

of which, 4 were elective surgery (due to previous CS) and 89% were done under emergency condition. History of previous CS was the most common cause of surgery; other causes are shown in Figure 3.

Standard monitoring including non-invasive blood pressure, electrocardiography and pulse oximetry and capnography in case of general anesthesia (GA) was established for those undergoing CS. The anesthetic technique of choice was spinal anesthesia. If the condition of mother and fetus did not allow neuraxial block, GA was performed.

In terms of anesthesia technique 28 (73.68%) patients underwent spinal anesthesia with 10 to 15 mg hyperbaric bupivacaine 0.5%, two of which had failed spinal and were converted to GA, 9 other parturient had undergone GA with rapid sequence induction via 3-5 mg/kg thiopental sodium and 1-1.5 mg/kg succinylcholine, two of them were not extubated at the end of surgery because of COVID-19 severity. Eighteen mothers were admitted to ICU after surgery. Mean length of ICU stay was  $3.82 \pm 6.65$  days, while mean residency in COVID wards and overall hospital stay was  $4.3 \pm 3.47$  and  $8.11 \pm 7.49$  days, respectively. Four (0.09%) women died; one because of intracranial hemorrhage and three due to COVID-related respiratory failure.

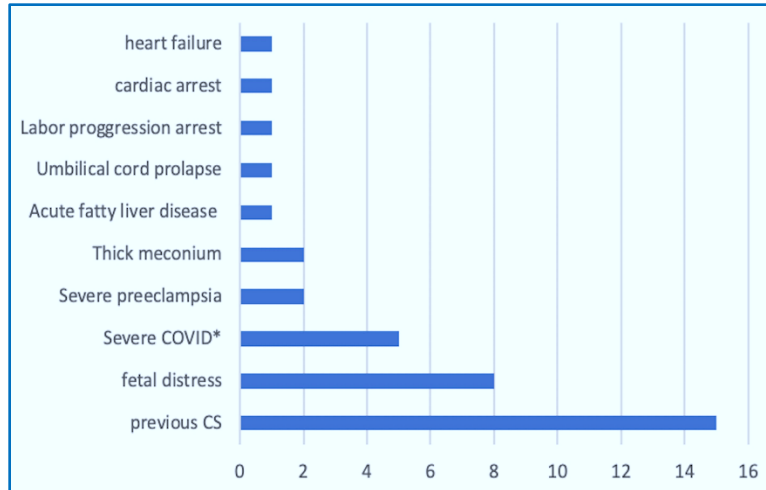
In our study, rate of preterm labor was 31.81%. Apgar score was utilized to initially evaluate neonates' condition: Mean Apgar score during the first minute of birth was  $8.02 \pm 2.01$ ; improving after 5 min to  $9.27 \pm 2.29$ . There was one intrauterine fetal death due to mother's severe condition. Ten neonates were transmitted to neonatal intensive care unit (NICU), three of them were intubated and did not survive; all of whom



**Figure 2: Frequency of patient's symptoms at the onset of disease**

**Table 2: Neonatal characteristics**

Variable	Number (%)
<b>Gender</b>	
• Male	24 (54.54%)
• Female	20 (45.45%)
NICU admission	10 (22.7%)
<b>Outcome</b>	
• Expired	4 (9%)
• Discharged home	40 (91%)
NICU: Neonatal intensive care unit	



**Figure 3: Causes of cesarean section by frequency**

were born before 30 weeks of gestational age. Other than those who had expired, others were discharged with good condition (Table 2). PCR was done for 18 neonates, none of which was positive.

## 4. DISCUSSION

Our study found a relatively higher rate of cesarean deliveries and preterm birth (86.36% and 31% respectively). All neonatal deaths were related to low gestational age (< 30 weeks) and irrespective of severity of mother's disease.

Since the announcement of COVID-19 pandemic more than 600 million people around the world were affected, and about 7 million of them deceased.<sup>15</sup> During this period, healthcare providers started to share their knowledge and experience in a timely manner in order to help people survive. Undoubtedly, the parturients and the future of their neonates, were also affected. However; data around the world showed conflicting results in different countries.<sup>9,16,17</sup> In this study we focused on parturients who were positive for COVID-19 at the time of delivery and aimed to describe their characteristics, mode of delivery and final outcome of both the mothers and the neonates.

Severity of COVID-19 pneumonia course in pregnant is reported to be similar to others, but they are more prone to severe complications in the presence of comorbidities such as obesity and hyperactive airway diseases. Rate of preeclampsia, chronic hypertension, preterm labor and cesarean section is also higher in those who suffer from critical COVID-19 infection.<sup>8,9</sup> In our study rate of preterm labor was reported 31% which is consistent with the results of already published studies. Five pregnant women in our study had severe COVID-19 infection at the time of delivery, one had normal vaginal delivery as

the neonate was diagnosed to be intra uterine fetal death, 3 underwent CS with spinal anesthesia and the last was delivered during cardiopulmonary resuscitation.

The superior mode of delivery remains natural vaginal delivery, even during the pandemic.<sup>18</sup> A great concern specially at the beginning of pandemic was vertical viral transmission during natural vaginal delivery.<sup>19</sup> In a review by Tolu et al., only 4.4% of neonates had positive throat swab RT-PCR. Surprisingly, all were born by CS.<sup>14</sup> A systematic review by Dr. Huntley et al. also failed to prove vertical transmission of virus during delivery. They also concluded that increased rate of preterm labor and CS rate is related to geographic heterogeneity.<sup>20</sup> Intrauterine

transmission during gestation is likely, yet evidence of transmission during delivery is scarce.

Despite this lack of evidence about vertical transmission, COVID itself became an indication for CS in some countries at the beginning of the pandemic.<sup>18,19</sup> However current evidence does not support CS as primary mode of delivery for infected parturient and decision for delivery must be individually made based on the obstetric and maternal condition.<sup>21-23</sup> Rate of CS in COVID positive parturients remained constant in some countries such as USA, increased in others such as China and India and decreased in some like Saudi Arabia.<sup>24-28</sup> Since According to a study conducted by Pourshirazi et al. rate of CS in Iran before pandemic was about 53% between March 2018 and March 2021 which is far beyond developed countries and WHO recommendations.<sup>29</sup> On the other hand, CS in COVID-19 patients is associated with increased mortality.<sup>30</sup> In the present study, rate of CS was 86%. Almost all of the surgeries had an obstetric indication, the most frequent indication was prior CS. Thus, this higher than usual rate is not only because of fetal distress but also as a consequence of previous trend for surgical delivery in Iran.<sup>31</sup>

In our study 13% of mothers were asymptomatic despite being infected. None of the neonates of aforementioned parturients were born before 37 weeks gestation, nor had Apgar score under 7 at the time of birth. This result is also consistent with a review done by Khan et al. which emphasized critically ill parturients are expected to have worse outcome. They also concluded that maternal comorbidities and race increased the likelihood of developing infection and becoming symptomatic. Black and Hispanic parturients became more infected and symptomatic than white parturients.<sup>8,24</sup> In addition, American mothers were more asymptomatic than



Europeans and Asians, which may be due to higher rate of diagnostic tests done.<sup>9</sup> Jenabi et al. also studied neonatal outcome in west of our country. They found that the rate of CS as well as low birth weight was significantly higher in symptomatic group which is consistent with our findings.<sup>32</sup>

In regards to anesthesia approach, spinal anesthesia remains the method of choice in infected parturient, unless it is contraindicated or there is an obstetric indication.<sup>33, 34</sup> In our hospitals, spinal anesthesia was also the preferred method by the anesthesiologists and no relative complication was reported.

## 5. LIMITATIONS

It was a single-center study with a limited data. A multi-center study with a large sample size would allow us to draw definitive conclusions.

## 6. CONCLUSION

COVID-19 mostly influenced maternal and neonatal outcome by increasing preterm labor and associated complications; however, it is not an indication for either cesarean section or general anesthesia. Moreover, spinal anesthesia remains the choice of anesthesia in this population. Finally, overall outcome of mothers with critical disease at the time of delivery is worse than the parturient with mild or asymptomatic disease. COVID-19 is still affecting people around the world, so we still need to share our experiences for the best decision making.

This pandemic was not the last we confronted; the most important lesson of this pandemic was real-time sharing of valid data and acceleration of translational research process.

### 7. Data availability

The numerical data generated during this research is available with the authors.

### 8. Acknowledgement

The authors would like to express their gratitude to Taleghani Hospital clinical research development unit.

### 9. Conflict of interest

The study utilized the hospital resources only, and no external or industry funding was involved.

### 10. Authors' contribution

MD, MY: concept, study design

SD, MM: editing manuscript

FM: statistical analysis, manuscript writing

AS, MV: collecting data, revising manuscript

ST: conduction of study

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