



RETROSPECTIVE ANALYSIS OF COVID-19 POSITIVE PARTURIENTS POSTED FOR CAESAREAN SECTION IN TERTIARY CARE CENTRE

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ABSTRACT

Background And Aims: Parturients posted for LSCS present with physiological changes due to pregnancy and gravid uterus, may have associated co-morbidities, superadded by COVID 19 infection poses a real challenge for an anesthesiologist. Urgency in obstetric anesthesia and extreme precautions needed to avoid this contagious disease further increase the burden on the anesthesiologist. This study focuses on perioperative presentation, management, and outcome of patients in a tertiary level hospital.

Method: 329 pregnant females with RAT or RTPCR positive for COVID 19 and undergoing cesarean section from 1st May 2020 to 31st July 2021 were included in this retrospective observational study. Data was collected and analyzed from OT, ICU, WARD records, patient medical and electronic records, and maternal mortality data.

Results: Amongst 329 parturients, 98.48%(324/329) received spinal anesthesia, one received epidural anesthesia (0.30%) and 1.21%(4/329) required general anesthesia. The incidence of hypotension was 5.77% (19/329), managed with inj. Mephentermine without inotropes. The intraoperative course was uneventful except for one case of CRA, revived successfully. Nine patients (2.73%) required ICU care. Oxygen support by either nasal prongs or face masks was given to 3.95% (13/329) patients. Three patients (0.91%) required NIV support and three patients (0.91%) required invasive ventilation postoperatively. The overall mortality was 0.61% (2/329). The mean duration of hospital stay was found to be 8.2 ± 5.03 days

Conclusion: Neuraxial anesthesia remains a technique of choice for LSCS and can be safely employed in the parturients even with moderate pneumonia. General anesthesia can be reserved for patients of severe covid pneumonia.

KEYWORDS : COVID 19, LSCS, Pregnant females

INTRODUCTION:

At the end of 2019, a new virus named SARS –CoV-2 causing COVID 19 was detected in China. The disease was initially reported on December 31st, 2019 by the WHO, but it was declared as an outbreak on January 30th, 2020, On March 11th, 2020, the WHO further declared COVID-19 as a global pandemic^[1,2]. At the time of this writing, this pandemic has involved over 191,445,982 cases and has caused the death of 4,109,432 people worldwide^[3] Exposure to this pathogen predisposes both mother and fetus to an increased risk of infection and severe adverse maternal and perinatal outcomes.^[4] The physiologic and immunologic changes during pregnancy increase maternal morbidity and mortality.^[5]

The cesarean section is the most common major surgery in the world^[6] The management of infected patients poses a challenge as it is contagious. Anaesthesiologists are at significant risks of viral exposure during endotracheal intubation and maintaining patients under general anesthesia in these patients. In SARS and Middle East Respiratory Syndrome (MERS), up to 35% and 41% of pregnant patients require mechanical ventilation, and mortality rates were as high as 18% and 25% respectively^[7,8,9] However, in a report from the Centers for Disease Control and Prevention (CDC) COVID-19 Response Pregnancy and Infant Linked Outcomes Team that included over 23,000 pregnant persons and over 386,000 nonpregnant females of reproductive age with symptomatic laboratory-confirmed SARS-CoV-2 infection, pregnant patients had a higher risk as compared to non-pregnant women of ICU admission (10.5 versus 3.9 per 1000 cases), receiving invasive ventilation (2.9 versus 1.1 per 1000 cases), Death (1.5 versus 1.2 per 1000 cases)

This study aimed to compile demographic data, anesthetic

management, perioperative complications, a requirement of oxygen and ventilatory support, mean duration of hospital stay, and morbidity and mortality in parturients posted for LSCS in tertiary care hospitals.

METHODS:

After the approval of the protocol by the Institutional Ethics Committee, the study was carried out with the principles of the Helsinki Declaration. All parturients who had positive Reverse Transcriptase Polymerase Chain Reaction or Rapid Antigen Test for COVID 19 and who underwent cesarean section between 1st May 2020 to 31st July 2021 were included in this tertiary care center retrospective, observational cohort study.

The analysis was carried out with the aims to study the clinical presentation, anesthetic management in terms of the technique of anesthesia, hemodynamic variations, need for vasopressors, and to study the postoperative course, morbidity, mortality, and mean length of hospital stay.

These data were collected retrospectively using medical files (both paper and electronic), admission notes, operative notes, anesthesia notes, discharge summary, OT records, ICU, WARD records, maternal mortality data.

Data were analyzed using epi info software. Continuous data were expressed in mean \pm standard deviation, while categorical data were expressed in numbers (percent). Spearman's correlation test was used for correlation analysis. The value of $p < 0.05$ was considered statistically significant.

RESULTS:

A total of 329 patients from 1st May 2020, as we had our

inaugural case on 5th May 2020 to 31st July 2021 were included in the study and further statistical analysis. The patients coexisting disorders and laboratory evaluation are shown in Table 1.

All cesarean sections were conducted in dedicated OR (Operating Room) for COVID 19 with air conditioning turned off as negative pressure OR not available in our institute. Level 3 PPE consisting of N95 masks, impervious jumpsuits with hoods, goggles, face visor, shoe covers, and double medical gloves were worn by the entire team (anesthesiologists, obstetricians, neonatologists, nursing staff, and assistants). Anesthesia was administered by two anesthesiologists, including an experienced one and a junior resident. A third anesthesia resident was kept ready outside the OR as a runner in case of need. After the end of the surgery, the patients were transferred to the COVID wards or COVID ICUs accordingly.

Table 1: Co-existing Disorders And Laboratory Findings Of Study Population

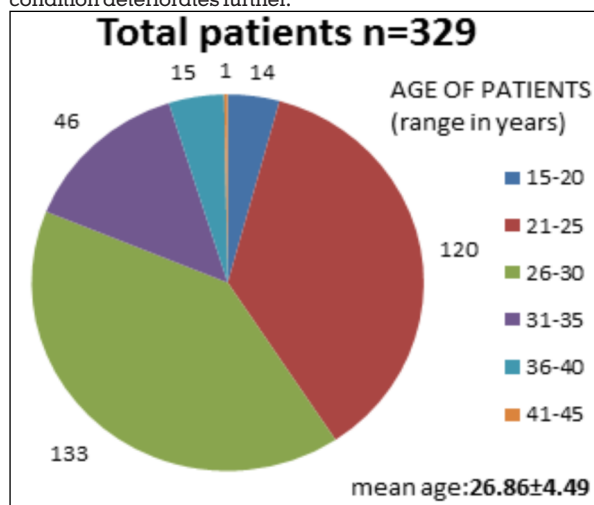
Coexisting disorders	Total numbers (n=329)	Percentage
Pneumonia	24	7.29%
Placental abnormalities	3	0.91%
Heart disease	3	0.91%
Preeclampsia	28	8.51%
Thyroid disorders	30	9.11%
Sickle Cell Disease (AS/SS pattern)	10	3.03%
Seizure disorder	1	0.30%
Thalasemia	1	0.30%
Diabetes Mellitus	2	0.61%
Gestational Diabetes Mellitus	4	1.21%
Pulmonary Tuberculosis	1	0.30%
Laboratory Findings	Range	Mean ±SD
Hemoglobin,g/dl	5.8-16.5	10.73 ± 1.51
Platelet	58000-324000	191233.8 ± 4664.5
C-reactive protein(mg/dl)	0.3-173	65.56 ± 10.71
TLC(mcl)	4.55-21.6	7.94 ± 3.2

The neuraxial block was considered as it minimizes the need for general anesthesia in case of emergency cesarean section [10]. A single-shot spinal anesthesia was performed with a thin Quincke spinal needle of 25 G in the left lateral position with hyperbaric bupivacaine 2 ml (10 mg) in L3-L4 subarachnoid space. Spinal anesthesia was administered to 98.48% (324) parturients. No case of failed spinal occurred. All patients received Inj oxytocin 10 U after the delivery of a baby. Carboprost was avoided in symptomatic patients as prostaglandin F2alpha causes bronchoconstriction and pulmonary vasoconstriction.

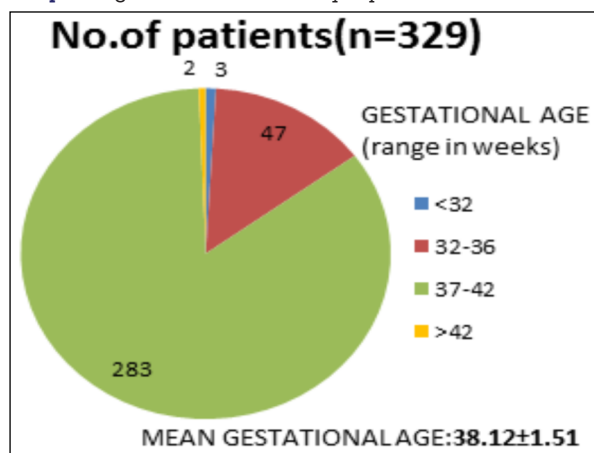
Epidural anesthesia was applied in a 23-year-old Primigravida with 36+2weeks gestation with k/c/o Rheumatic Heart Disease with severe MS, mild AR, moderate TR, severe PAH with dilated LA receiving cardiac medications. The procedure was uneventful and the patient was discharged after 20 days. General anesthesia was applied to four patients, all due to obstetric indications.

Details of all patients are noted in table 2. Rapid sequence intubation was done using Propofol and succinylcholine in 2 patients and Etomidate and Succinylcholine in patients with heart disease, fentanyl and sevoflurane were used after delivery of a baby. Extubation of all 4 patients was done in OR itself without any complications. The rate of hypotension in patients undergoing general anesthesia is null and in SAB is 5.77% (19/324). Hypotension was managed by injection Mephentermine with no inotropic support needed in any patient.

Two hundred eighty (85.11%) were asymptomatic, and 49 (14.89%) patients were symptomatic in the preoperative period. The overall symptoms were cough, cold, fever, dyspnea, headache, and loose motions. The requirement for postoperative ICU was 2.73% (9/329) in all parturients and 14.28% (7/49) in symptomatic patients. Patients requiring oxygen support by either nasal prongs or face mask was 3.95% (13/329) and 26.53% (13/49) in symptomatic patients. Three patients (0.92%) required non-invasive ventilator support of which one was weaned off in 7 days and discharged. Three patients (0.91%) required invasive ventilator support postoperatively. The mortality rate was 0.61% (2/329) in all patients and 4.08% (2/49) in symptomatic patients. The first case was a 27-year-old G3P2L2 with previous 2 LSCS with oligohydramnios with cough. Her Spo2 was 88% on room air and 94% on 6L O2 by venti mask. On shielded chest x-ray she had bilateral lower zone bronchopneumonia. Two days after admission she underwent LSCS under SAB and was shifted to ICU after an intraoperative uneventful course. However, the next day patient was put on NIV support because of clinical deterioration. The patient died on day 2 of LSCS, 6 hours after intubation. The total stay in the hospital was 4 days. The second case was a 24-year-old Primigravida with Fetal distress who had h/o cough, cold, fever, breathlessness for 5 days and maintaining SpO2-96% on 8L O2. She immediately underwent LSCS under SAB after admission and shifted to ICU for further care. Her X-ray revealed zone 4 involvement and HRCT thorax was showing a CT score of 19/25. She was put on NIV on day 4 LSCS due to tachypnoea and intubated on Day 6 LSCS. However patient succumbed on Day 8 as her condition deteriorates further.



Graph 1: Age Distribution Of Study Population



Graph 2: Gestational Age Distribution In Study Population

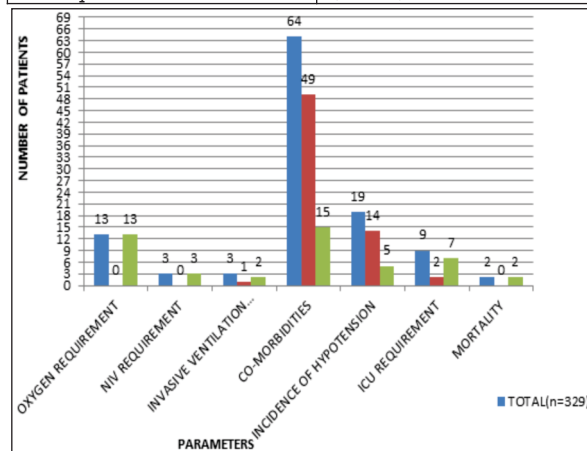
Table 2: Details Of Parturients Undergoing LSCS Under General Anaesthesia

PARAMETERS	CASE 1	CASE 2	CASE 3	CASE 4
Age (years)	25	23	27	24
Parity	Primi	G2P1D1	G2A1	Primi
Gestational age(weeks)	37 weeks	35weeks	38 + 2weeks	38 weeks
Indication for LSCS	Primi with severe preeclampsia with anemia with thrombocytopenia	G2P1D1 with k/c/o heart disease for safe confinement (failed epidural)	G2A1 with k/c/o RHD with mild AR, mild MR with moderate AS with bioprosthetic valve in situ	Primi with severe preeclampsia with thrombocytopenia
Co-existing disorders	Preeclampsia	Heart disease, Mod MS, severe MR, moderate TR mild PAH	Heart Disease with aortic valve replacement for AR done with bioprosthetic valve in situ, moderate AS, mild AR, mild MR	Preeclampsia
Symptoms	Asymptomatic	Symptomatic	Symptomatic	Asymptomatic
SpO2	Pre-op	98% on RA	98% on RA	99% on RA
	Post-op	98%on RA	98%on RA	98% on RA
Investigation				
Hemoglobin	5.6—7.7—8.2	9.7	11.2	9.9
Platelet	40000---100000	126000	81000	56000---113000
CRP	1.1	1.7	11.6	2.1
D-dimer	0.4	109	905	127
Extubation	In OR	In OR	In OR	In OR
ICU care	No	No	Yes	No
Maternal outcome	Discharged	Discharged	Discharged	Discharged
Length of hospital stay	10days	12 days	12 days	7 days

The mean length of hospital stay was 8.2 ± 5.03 days (min-max 3-55) days. Four patients' hospital stay was significantly longer than the other patients due to obstetric indications. Two of these patients, who were admitted for 51 days and 25 days was having thrombocytopenia, HELLP Syndrome, SS pattern, and had severe anemia and followed up for transfusion of blood products. One patient was presented in early gestation with placenta previa grade 4 and hence followed up in a ward for weekly Doppler and monitoring which later underwent LSCS had a stay of 55 days. One patient was admitted for 24 days as she had wound gaping and underwent resuturing twice with antibiotic cover.

Table 3: Length Of Hospital Stay

Length of hospital stay in days	Number of patients(n=329)
< 5 days	33 (10.03%)
5-10 days	242 (73.55%)
11-15days	44(13.37%)
16-20days	10 (3.03%)
21-25days	5 (1.51%)
>25days	2(0.60%)



Graph 3: Comparison Between Symptomatic And Asymptomatic Study Population

Correlation analysis of mortality revealed significant positive correlation with type of anaesthesia ($p=0.006$), highly significant correlation with oxygen requirement ($p=0.0002$), and negative correlation with pre-existing co-morbidities ($p=0.92$), while correlation analysis of need of general

anaesthesia revealed significant positive correlation with co-morbidities ($p=0.009$), highly significant correlation with ICU requirement ($p=0.001$) and negative correlation with symptoms of COVID 19 ($p=0.71$). Though there is a positive correlation with a technique of anaesthesia, these deaths were attributed to COVID-related respiratory involvement and not due to complications of spinal anaesthesia.

DISCUSSION:

In pregnant females, the presentation of COVID-19 infection appears to be no different than other adults, but many of these non-specific symptoms may be attributed to symptoms of pregnancy and labor. For example, signs of latent labor may include myalgia and diarrhea; pre-eclampsia can present with headache; shortness of breath is perceived during pregnancy and labor; and chorioamnionitis may be a cause of tachycardia and fever, leading clinicians to overlook COVID-19 infection as a possible diagnosis.^[11]

In the case of patients undergoing general anaesthesia, to prevent the contamination of the Entonox circuit, two high-quality Heat and Moisture Exchange Filters were placed; first, between the tracheal tube and breathing circuit; and second between the expiratory limb and anaesthesia machine^[14,15] These HME filters can remove up to 99% of airborne particles 0.3microns or greater, thus help in preventing contamination of OT atmosphere. Preoxygenation with low flows in a closed circuit was done. Positive pressure ventilation was avoided till inflation of the cuff. Rapid sequence induction and intubation with video-laryngoscopy were done. Patients with COVID-19 tend to be more agitated during emergence.^[5] This may result in a higher incidence of coughing compared to intubation^[16]. Pregnancy leads to a physiologic decrease in PaCO2 and hence, if possible, ventilation should be titrated to maintain this in the range of 28–31 mmHg to augment off-loading of oxygen to the fetus. Else, a lung-protective strategy should be followed such as the ARDS net ventilator protocol and the priority should always be maintaining oxygenation. All patients were extubated in OR itself except one which underwent Intraoperative CRA was transferred to ICU and extubated the day after.

Chen et al.^[12] applied general anaesthesia to three of 17 COVID-19 positive patients undergoing cesarean section, and the remaining 14 patients received epidural anaesthesia. While no hypotension was observed in the general anaesthesia group; the hypotension rate was as high as 86% in the

epidural group. Our study results showed no incidence of hypotension in the general and epidural anesthesia group which was administered to 4 and 1 patient respectively while incidence of hypotension in the Spinal anesthesia(324/329) group was 5.86%, managed with mephentermine. We considered a decrease of more than 20% in systolic arterial pressure than the baseline value as hypotension. As the incidence of hypotension is likely to be higher, dehydration should be corrected before administering regional anesthesia.

It is recommended to have a minimum baseline recent platelet count before proceeding to surgery or neuraxial block. The lower limit of platelet count for performing neuraxial procedures is $70,000 \times 10^6 /L^{17}$, to avoid spinal/epidural hematoma. However, respiratory compromise with general anesthesia is much higher, and hence neuraxial procedures at even lower platelet counts should be considered¹¹¹. The virus has been isolated from cerebrospinal fluid (CSF) in patients with COVID 19encephalitis, hence an attempt was made to avoid contamination by not allowing CSF to trickle after SAB¹²³

Case series, totaling 77 patients in the present literature, have reported uneventful neuraxial procedures inclusive of spinal, epidural, and combined spinal-epidural (CSE) anesthetics, with an unremarkable postoperative course.^{4,20-22} One of these patients was on maximal non-invasive ventilation at the time of cesarean delivery²¹. From our study, the evidence we may infer that neuraxial techniques are reasonably safe as we administered it to patients having pneumonia, and found no postoperative complications. In a study by *Karasu D et al(2020)*-A total of 61 parturients undergoing cesarean section,41 patients(67.2%) were asymptomatic, and 20 (32.8%) patients were symptomatic in the preoperative period. While in our study, we found a large number(280/329) 85.11% of asymptomatic patients as compared to 4.89% symptomatic(49/329) patients. Overall mortality in pregnant women undergoing cesarean section was 1.6% which is more as compared to 0.61% in our study. The mortality of 0.61% doesn't reflect the mortality of Covid positive ANC patients as it includes only patients taken for LSCS.

In a study by *Ashokka B et al (2020)*-general anesthesia should be chosen when a COVID 19 parturient presents with desaturation (<93%)or when clinically indicated by maternal-fetal reasons. We consider regional anesthesia in patients with SpO₂>93% with or without oxygen supplementation. We found that patients with oxygen requirement <6 liters/min tolerated spinal anesthesia very well and their oxygen requirement either stayed the same or even diminished post-operatively as their FRC improved after removal of the baby. The neuraxial block was found to reduce chances of aerosol generation by avoiding airway manipulation and provides excellent surgical conditions. In a report by *Subramanian H¹⁸³*, Spinal anesthesia was provided to a patient with COVID 19 pneumonia with SpO₂ of 98% on NRBM 15l/min, having multiple co-morbidities and ARDS with a good postoperative maternal outcome.

Though the risk of epidural or subarachnoid space seeding with viraemic blood, causing encephalitis or meningitis, is exceedingly rare, it remains a theoretical possibility¹². There was no reported case of post-dural puncture headache in COVID 19 infected pregnant females. The practice of high flow oxygen for fetal distress does not improve fetal outcomes and should be suspended because of the risk of aerosolization.¹¹¹ However, when indicated, oxygen was supplemented inside the OR (Operating Room) via face masks or nasal prongs with a fluid resistant surgical mask over the device which limits the aerosol generation and droplet spread especially in symptomatic patients. Consider avoiding magnesium sulfate as it has a central nervous system and respiratory system

depressant effects, or as an alternative to usual dosing, 4 g bolus may be preferred.¹⁷⁷

For the patient with severe illness, there are multiple issues to consider and the timing of delivery needs to be individualized. The choice of anesthesia in COVID 19 positive parturients undergoing cesarean section should be determined by the urgency of cesarean section, obstetric considerations, and maternal condition. There is a rapid deterioration in the symptomatic patient; hence the ideal time of cesarean section is crucial. General anesthesia should be reserved for patients with obstetric indications, the urgency of delivery, and severe pneumonia who will likely require ventilatory support.

CONCLUSIONS:

In our study, 7.29 % of patients had pulmonary involvement and the mortality was 0.61% but it doesn't reflect the true burden of mortality and morbidity in COVID positive ANC patients as those who were posted for LSCS were included in the study whereas actual data may be higher.

Limitation: Fetal outcome data was not included in the study.

Conflict Of Interest –Nil

Funding-Nil

Sponsorship-Nil

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