ORIGINAL ARTICLE

Clinical Characteristics of Obstetric Patients Admitted in ICU During COVID-19 Pandemic and its Comparison with Pre-COVID Period: A Retrospective Analysis from North India

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Abstract

Background: It was initially believed that coronavirus disease-2019 (COVID-19) increased the risk of complications as well as mortality in obstetric patients. This study was done to analyze any difference in-patient admissions, indications and outcomes in the obstetric ICU before and during the COVID-19 pandemic.

Materials and methods: A retrospective study of obstetric cases admitted to the intensive care unit over a period of 6 years was done. The 6-year period was divided into 2 groups, pre-COVID-19 era (1st March 2017–1st March 2020) and the COVID-19 pandemic (2nd March 2020–2nd March 2023). The causes of admission, clinical characteristics, interventions required and outcomes of these patients were compared to see if there was any difference between the two periods and whether COVID-19 out obstetric patients at any additional risk as compared to patients admitted during the pre-COVID-19 period.

Results: It was found that there was no significant difference in the number of admissions, associated problems, interventions required and outcomes of patients between the two groups. The data seemed to suggest that the number of abortions have increased post COVID-19, but further studies would be required for that.

Conclusion: Obstetric patients did not seem to be at an increased risk for ICU admission due to SARS-CoV-2. Furthermore, no additional increase in morbidity or mortality was observed in those patients in comparison to those admitted before the pandemic.

Keywords: Coronavirus disease-2019, Intensive care unit admission, Obstetric patients, Outcome.

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Highlights

- The coronavirus disease-2019 (COVID-19) pandemic has placed an unprecedented burden on healthcare around the world. Though, the disease is often mild but, in high-risk populations severe disease often leads to increased morbidity and mortality. It was initially believed that obstetric patients were at a greater risk of morbidity and mortality due to SARS-CoV-2 infection.
- In our study, no difference was found in admissions, associated conditions and interventions required among patients during COVID-19 pandemic as compared with patients admitted before the pandemic.
- No difference in outcome among these patients, hence no additional risk in obstetric patients due to COVID-19.
- No of abortions seem to have increased in the post COVID period.

Introduction

Obstetric emergencies are a challenge to the obstetrician and anesthetist because of the altered physiology of pregnancy, the rapid deterioration of maternal and fetal conditions in case of a complication, and the simultaneous management of two lives with different physiologies.[1]

The COVID-19 pandemic has placed an unprecedented burden on healthcare around the world.[2] Though disease is often mild, in high-risk populations, severe disease often leads to intubation, intensive care admission (ICU) admission, and in many cases death. It was initially believed that obstetric patients were at greater risk of morbidity and mortality due to COVID-19.[3]

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This study was done to see if there was any difference in patient admission, clinical characteristics and outcome in patients admitted to obstetric ICU before and during the COVID-19 pandemic.

Materials and Methods

A retrospective study of obstetric cases admitted to the intensive care unit over a period of 4 years was done. The 6-year period was divided into 2 groups, pre-COVID-19 era (1st March 2017–1st March 2020)

and during the COVID-19 pandemic (2nd March 2020–2nd March 2023). The study was conducted in a tertiary care hospital, one of the largest maternity hospitals in Kashmir Valley, and a referral center for high-risk pregnancies. Cases from all over the Kashmir Valley including district hospitals and far-flung areas, are referred to this institute, especially high-risk cases. All obstetric patients who were admitted to the ICU during the study period were included in our study.

The following data was collected: Diagnosis, baseline demographics, and the indication of admission into the ICU. The ICU intervention in terms of the use of vasopressors, blood transfusions and mechanical ventilation (MV) was recorded. The patients were followed up until they were shifted from the ICU. Comparing whether there was any difference in the outcome of these patients was the primary outcome. The secondary outcome was the comparison of the indications for obstetric admission to the ICU. Either a positive RT-PCR or rapid antigen test was used to detect COVID-19 positive cases.

Our ICU is a four-bedded obstetric ICU, dedicated only to obstetric cases, with 24-hours laboratory and blood-bank facilities. Cardiologists, nephrologists, hematologists, pulmonologists, neurologists and gastroenterologists are available whenever required for consultation. Due to the high patient load in our hospital, especially high-risk pregnancies, patients once stabilized but still requiring ICU care are at times shifted to the 8 bed SICU or 7 bed SICU-2 of Government Medical College, depending on the availability of beds in the ICU.

During the time period when this study was conducted, there were 3 waves of COVID-19. The patients including obstetric, if already diagnosed with COVID-19 were sent directly to SICU-2, a separate 7 bedded ICU dedicated to COVID patients in Government Medical College, or if diagnosed later on, were shifted from our obstetric ICU to SICU-2 for further management. This was done to limit the spread of SARS-CoV-2 during these waves and to keep patients who were admitted for causes other than COVID-19 segregated and safe from further insult. Those patients directly admitted to SICU 1 or SICU 2 of government medical college were also included in our study.

Categorical variables were presented in numbers and percentages (%). Qualitative variables were correlated using the Chi-square test. A p-value of < 0.05 was considered statistically significant.

All obstetric patients were included in our study to prevent any bias.

Results

In our study, a total of 2,103 patients were admitted to the obstetric ICU, out of which 986 patients were admitted in the pre-COVID era and around 1,117 patients were admitted during the COVID era.

Higher percentage of patients belonged to age group "21–30" followed by "31–40" (53.55 and 33.17% respectively in pre-COVID era and 53.89 and 33.57% during COVID era) in both the groups. Majority of the patients who were admitted to the ICU before COVID era were referrals, while during COVID era, the maximum number of patients were direct admissions (67% were referrals during pre-COVID era, while 53% were direct admissions during COVID era. Roughly 60–62% of patients admitted to the ICU were multigravida during both the pre-COVID era and during COVID era.

During COVID era out of 1,117 patients admitted in our ICU, 392 patients were COVID positive, out of which 370 were incidental findings. Only 22 patients admitted had symptoms associated with COVID-19.

Demographic profile of patients can be found in Table 1.

Major causes of admission to the ICU were obstetric hemorrhage (48.07% in pre-COVID era and 47.44% in COVID era), hypertension (23.22% in pre-COVID era and 23.09% during COVID era), severe anemia (4.36% in pre-COVID era and 4.65% during COVID era), and sepsis (3.58% in pre-COVID era and 3.76% during COVID era). Comparison of major obstetric and medical conditions requiring ICU admission during the pre-COVID era and COVID era can be found in Table 2.

Patients admitted in both the groups had similar associated problems, including hemodynamic insufficiency, respiratory insufficiency, and renal insufficiency. The results were not statistically significant. Table 3 lists the associated problems in patients admitted to both the groups. It is worth mentioning that the total number of patients didn't add up, as some patients had more than 1 associated problem.

Table 3 also mentions the ICU interventions which were performed in these patients. Majority of patients were admitted for monitoring only, in both the groups. The requirement for mechanical ventilator, inotropes, blood products and dialysis were similar in both the groups and not statistically significant.

The data about patients admitted in ICU during COVID era was also analyzed and divided into 2 groups, COVID positive patients and COVID negative patients. Their associated conditions, including end organ damage and supports required, were also compared (Table 4). It was found that only upper respiratory tract infection

Table 1: Baseline characteristics of patients admitted to obstetric ICU

Variable	*Category*	*Pre-COVID era*	*During COVID era*	*Chi-square*	*p-value*
Age (years)	18–20	76 (7.70%)	81 (7.25%)	0.21	0.98
	21–30	529 (53.55%)	602 (53.89%)		(not significant)
	31–40	327 (33.17%)	375 (33.57%)		
	41–50	54 (5.57%)	59 (5.28%)		
Gravida	Multigravida	786 (62.08%)	672 (60.16%)	0.92	0.35
	Primigravida	480 (37.91%)	445 (39.84%)		(not significant)
Hospital admission	Direct	408 (32.22%)	602 (53.89%)	114.08	$p < 0.001$
	Referral	858 (67.77%)	515 (46.10%)		(result is significant)
COVID test positive (total)		Not applicable	392		
(1) Incidental finding on testing			370 (94.38%)		
(2) Admitted due to COVID associated problems			22 (5.61%)		

Table 2: Major obstetric and medical conditions requiring ICU admission

Conditions	*No. of patients in non-COVID era*	*Percentage (%)*	*No. of patients in COVID era*	*Percentage (%)*
Obstetric hemorrhage				
Antepartum hemorrhage	156	15.82	165	14.77
Postpartum hemorrhage	223	22.61	242	21.66
Abortions	16	1.62	43	3.84
Ectopic	72	7.30	74	6.62
Ruptured uterus	6	0.65	5	0.44
Molar pregnancy	1	0.10	1	0.08
Hypertensive disorder of pregnancy	229	23.22	258	23.09
Severe anemia	43	4.36	52	4.65
Heart disease	66	6.69	76	6.80
Sepsis	35	3.58	42	3.76
Respiratory tract infection/pneumonia	57	5.78	77	6.89
(Others: Total)	82	8.31	(82)	7.34
Anaphylaxis	11		12	
Suspected PTE	8		8	
Portal hypertension	2		1	
Acute liver failure	3		2	
Seizures	36		39	
Acute gastroenteritis	3		6	
Masseter spasm post scoline	1		2	
Splenectomy	1		0	
Ischemic stroke	4		6	
Factor VII deficiency	2		1	
DKA	8		4	
LSCS with high spinal anesthesia	3		1	

Chi-square, 12.29, *p*-value (between 0.2 and 0.5), not significant

Table 3: Associated problems

*Associated problems in ICU**	*Patients admitted before COVID*	*Patients admitted during COVID*
Cardiac insufficiency	198	212
Respiratory insufficiency	282	315
Hepatic insufficiency	118	108
Renal insufficiency	210	248
Neurological insufficiency	120	118
Coagulopathy	136	156
Hemodynamic insufficiency	256	285
ICU intervention		
*Procedure***	*No of cases in non-COVID era*	*No of patients in COVID era*
Monitoring	963	1,012
Mechanical ventilation	195	227
Blood or blood product transfusion	519	589
Inotropes	450	508
Antihypertensive	332	390
Anticonvulsant including $MgSO_4$	336	402

*Chi-square, 3.45; *p*-value 0.6 (not significant); Total number of patients do not add up because patients had more than one associated condition; **Chi-Square; 3.42; *p*-value 0.80 (not significant); Total number of patients do not add up because patients needed more than 1 intervention in ICU

Table 4: To evaluate the individual indicators of ICU admission during COVID era

Associated conditions	*COVID positive patients (392)*	*COVID negative patients (725)*	*Chi-square test*	*Odds ratio*	*p-value*	*Confidence interval (95%)*
Acute respiratory distress syndrome	22	42	0.01	0.9	0.9	0.57–1.63
Pneumonia	19	21	2.5	1.67	0.1	0.8–3.15
Upper respiratory tract infection (without end organ damage)	12	7	6.42	3.17	0.01	1.23–8.11
Sepsis	48	105	0.82	0.84	0.3	0.58–1.21
Cardiac arrhythmias	48	87	0.01	1.02	0.9	0.70–1.48
Disseminated intravascular coagulation	9	28	1.83	0.59	0.18	0.27–1.27
Pulmonary edema	53	99	0.003	0.99	0.9	0.69–1.41
Seizures	28	58	0.22	0.89	0.63	0.55–1.42
Acute kidney injury	89	159	0.05	1.03	0.81	0.77–1.37
Deranged hepatic enzymes	31	77	1.77	0.74	0.18	0.48–1.15
Severe anemia	32	76	1.29	0.77	0.25	0.50–1.19
Blood product transfusion	188	401	1.73	0.86	0.1	0.70–1.07
Inotropes	160	348	2.01	0.85	0.1	0.67–1.06
Ventilatory support	72	155	0.95	0.85	0.3	0.63–1.15
Abortions	9	33	3.34	0.50	0.07	0.23–1.06
Mortality	4	17	2.33	0.43	0.13	0.14–1.30

Total number of patients may not add up because patients had more than one associated condition/multi-organ involvement during ICU stay

Table 5: Causes of maternal mortality

Causes	*Patients in non-COVID era*	*Patients in COVID era*
Obstetric hemorrhage	15	18
Sepsis (including but not limited post IUD and missed abortion)	12	15
Severe PIH	5	7
Coagulopathy	4	6
Cardiac insufficiency	4	6
Respiratory insufficiency (including both COVID pneumonia and other causes of pneumonia)	7	12

Chi-square, 0.46; *p*-value - 0.14; Total number of patients do not add up because some patients had multiple dysfunctions leading to arrest

was increased among COVID positive patients, as compared to COVID negative patients, and was statistically significant. Other than that, no other parameter was significantly increased among COVID patients as compared to non-COVID patients. Even mortality among COVID positive patients was not significantly increased.

The cause of maternal mortality was similar in both the groups, mainly obstetric hemorrhage, sepsis, respiratory insufficiency and severe PIH. Even though the number of patients who died of respiratory insufficiency was slightly more during COVID era, it wasn't statistically significant, (Table 5).

Out of the total 986 patients admitted to the ICU, 16 patients were admitted with diagnosis of abortion during the pre-COVID era, while as during COVID era, out of 1,117 patients, 43 patients were admitted as abortion. The Chi-square was 9.01, odds ratio was 2.3 with confidence interval of 1.32–4.23, and *p*-value was 0.0003 which was statistically significant. The data is mentioned in Table 6. It has to be noted that abortion was not statistically significant among COVID positive as compared to COVID negative patients (Table 4). Instead, it's incidence is higher during post-COVID period.

Discussion

Our maternity hospital is a 700-bedded facility dedicated to obstetric patients. In the month of April 2022, 13,827 patients were seen in the OPD of the hospital. Of these, nearly 3,000 were admitted to the hospital. In a day, 80 deliveries are carried out in the hospital, including natural births and Cesarean Sections.[4]

In our study, a total of 2,103 patients were admitted to the obstetric ICU, out of which, 986 patients were admitted in the pre-COVID era and around 1,117 patients were admitted during COVID time. Out of 1,117 patients, 392 were diagnosed as COVID positive (including both patients with incidental findings and symptomatic patients). Out of these 392 patients, only 22 had symptoms and complications due to COVID-19, rest were incidental findings, and out of these, 4 patients died.

On analyzing the baseline characteristics of patients, those were not statistically significant except for referrals, in which direct admissions to tertiary hospital had significantly increased during COVID time as compared to the pre-COVID era. It was due to the fact that, to curb the spread of COVID-19, referrals were not entertained in the hospitals unless it was a complication or high-risk pregnancy. Hence, patients would directly come to the hospital without any referral, even from far-flung areas.[4,5]

The majority of patients admitted in ICU were of postpartum hemorrhage and hypertensive disorders of pregnancy, before COVID (22.6 and 23.22%), as well as during COVID era (21.66 and 23.09% respectively). Overall, other causes of admissions in ICU

Table 6: Number of patients admitted with abortion in ICU during both eras

Patients	*No. of cases in pre COVID era*	*No. of patients in COVID pandemic*	*Chi-square*	*p-value*	*Odds ratio*	*95% CI*
Total patients	986	1,117	9.01	0.003 significant	2.3	1.32–4.23
Patients admitted with abortion	16	43				

were also similar with a Chi-square of 12.29 and *p*-value 0.3, not significant. It is to be noted that out of all the cases, number of abortions seemed to have doubled, with a Chi-square 9.01 and *p*-value 0.003, which is statistically significant, and imply that no. of abortions seemed to have increased during COVID pandemic. It is worth noting that abortion were increased among COVID positive patients, as compared to COVID negative patients, but were overall increased during the post COVID pandemic. The reason for this could be that post COVID pandemic, women have more chances of having abortion either because of exposure to the SARS-Cov-2 virus or because of COVID vaccine, but this would require more studies, with larger sample size of patients who had abortions.

Among the patients admitted to the ICU, the associated problems such as respiratory complications, cardiac insufficiency, and hemodynamic instability were similar in both groups, and the causes of maternal mortality (statistically insignificant). Only upper respiratory tract infection was more among COVID positive patients as compared to COVID negative patients. Even mortality was not increased, neither during COVID era nor among COVID positive patients.

Matthew J Blitz et al. published a study in 2020 whose results were similar to ours. They concluded that among hospitalized women who received a diagnosis of COVID-19, pregnant women were not at an increased risk for ICU admission as compared with non-pregnant women.[6]

Kadir Arslan et al. published a study in January 2023 in which they showed that the outcome was poor among COVID-positive patients as compared to non-COVID-positive patients. However their sample size was 102 patients, out of which 71 patients were non-COVID patients, whereas only 31 patients were COVID positive.[2,7]

Limitation of the study is that patient outcome were only analyzed till they were shifted from the ICU. Mortality after that was not included in the study. Furthermore, as RAT (Rapid antigen test) positive patients were also considered COVID positive, the risk of false positive or even false negative tests being included in the study cannot be ruled out. More studies will have to be conducted which would only include the COVID RTPCR positive tests. As SARS-CoV-2 keeps on mutating, more studies to compare the overall mortality in 3 years, vs mortality during different COVID waves will also be needed. It could be that morbidity and mortality increased during 1st wave of the pandemic but were not increased during 3rd wave, where the virus was highly infectious but not as deadly as its predecessors. Another limitation was that the neonatal outcome was also not included in the study.

Conclusion

A lot of studies have been published about obstetric admissions in ICU, but none so far have been compared the outcomes of patients before COVID pandemic and during the COVID pandemic. These studies throw light on the fact that even though COVID-19 has been responsible for a lot of mortality worldwide, it isn't responsible for increased maternal mortality.

Ethical Approval

The study was approved by the Institutional Review Board on 13-3-2024, ref. no. IRBGMC-SGR/NeuroAnest/442.

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