Original Article

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Comparison of Characteristics and Outcomes of Pregnant Women with COVID-19 in First and Second Wave Admitted in a COVID Hospital in Arunachal Pradesh: A Retrospective Observational Study

Obstetrics and Gynaecology Section

GOTER DOKE[1], TAMAR PALEY[2], BINITA SINGHA[3], TOMAR BASAR[4]

ABSTRACT

Introduction: Coronavirus Disease-2019 (COVID-19) has affected the pregnant women and newborn child across the world. Empirical data shows that the characteristic of the effect of COVID-19 virus varies between the subsequent wave.

Aim: To compare the demographic characteristics, severity of illness, Intensive Care Unit (ICU) admissions, maternal and neonatal outcomes in COVID-19 positive pregnant women of first and second wave.

Materials and Methods: A retrospective observational study was conducted at dedicated COVID-19 Hospital under Tomo Riba Institute of Health and Medical Sciences (TRIHMS) in Itanagar, Arunachal Pradesh, India. All COVID-19 positive pregnant women admitted between July 2020 and August 2021 were included in the study. The patients admitted during 1st July 2020 to 31st January 2021 were considered in 1st wave of COVID-19 and those from 1st February 2021 to 31st August 2021 as 2nd wave of COVID-19. Data of baseline characteristics, clinical presentations, severity, ICU admissions, abortion, modes of delivery, Neonatal Intensive Care Unit (NICU) admission, maternal and neonatal mortality were analysed and compared.

Results: A total of 144 COVID-19 positive pregnant women admitted from July 2020 to August 2021 were included in the study. Of 144 patients, 58 were in first wave and 86 in second wave of COVID-19. Number of moderate and severe cases admitted was 23.3% and 7% during second wave compared to only 12.1% moderate case only in first wave (p-value=0.015). Three pregnant women died due to severe COVID-19 pneumonia during the second wave. NICU admissions and other neonatal outcomes were comparable in both the study groups.

Conclusion: A significantly increase number of pregnant women were affected with severe COVID-19 morbidity and mortality in second wave. Neonatal outcomes were similar in both waves.

Keywords: Coronavirus disease-2019, Neonatal outcome, Pregnancy, Second wave of pandemic

INTRODUCTION

In December 2019, a series of pneumonia of unknown cause were reported in Wuhan, Hubei Province of China. Deep sequencing analysis from lower respiratory tract samples indicated a novel Coronavirus, which was named 2019 novel coronavirus [1,2]. COVID-19 rapidly triggered a global health emergency alert and spread to numerous countries, forcing World Health Organisation (WHO) to announce the start of a new pandemic on 12th March 2020 [3]. Women undergoing pregnancy, and those at the time of childbirth and puerperium constitutes a potentially vulnerable populations for COVID-19 illness [4]. The reason could be due to physiologic changes in pregnancy, including increased heart rate and oxygen consumption, oedema of respiratory tract, decreased lung capacity, a shift away from cell-mediated immunity and increased risk for thromboembolic disease [5]. The predominant clinical features of COVID-19 pregnancy are fever, cough, sore throat, myalgia, malaise, shortness of breath and diarrhoea [6,7].

Two systematic review and meta-analysis published at end of first wave suggested that pregnant women with COVID-19 are at increased risk of ICU admission, mechanical ventilation and maternal death compared with both pregnant women without Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection and non pregnant women with SARS-CoV-2 infection [8,9]. COVID-19 is a rapidly evolving situation, and there is still paucity of limited data reporting its impact on pregnant women. Also only one study on comparison of first and second COVID-19 wave has been reported from India [10]. Thus, present study aims to compare the demographic characteristics, severity of illness, ICU admissions, maternal and neonatal outcomes in COVID-19 positive pregnant women of first and second wave admitted in the Obstetrics ward of a Dedicated COVID-19 hospital of Arunachal Pradesh, India.

MATERIALS AND METHODS

This was a retrospective observational study conducted in the Department of Obstetrics and Gynaecology of Dedicated COVID-19 Hospital under TRIHMS in Itanagar, Arunachal Pradesh, serving as referral for all districts of Arunachal Pradesh, India. Institutional Ethical Committee (IEC) approval was obtained (No. TRIHMS/ETHICS/01/2019-20).

Inclusion criteria: All pregnant women who were tested positive by Rapid antigen test, Truenat and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) for (SARS-CoV-2) and got admitted in the dedicated COVID-19 hospital between July 2020 to August 2021 were included in the study.

Exclusion criteria: No exclusion criteria were made as all admitted pregnant women were analysed.

First pregnant woman with COVID-19 infection was admitted on 21st July 2020. The patients admitted during 1st July 2020 to 31st January 2021 were considered in 1st wave of COVID-19 and those from 1st February 2021 to 31st August 2021 as 2nd wave of COVID-19 and the data analysis was done in the month of October 2021.

Sample size calculation: The study by Mahajan NN et al., reported that 2.4% pregnant women with COVID-19 infection required ICU admissions [10]. Taking this value as reference, the minimum required sample size with 5% absolute precision and Z(1-α/2)=1.96 at 5% level of significance was calculated to be 36.

Total of 144 admitted pregnant women (58 in first wave and 86 in second wave) were included in present study.

Study Procedure

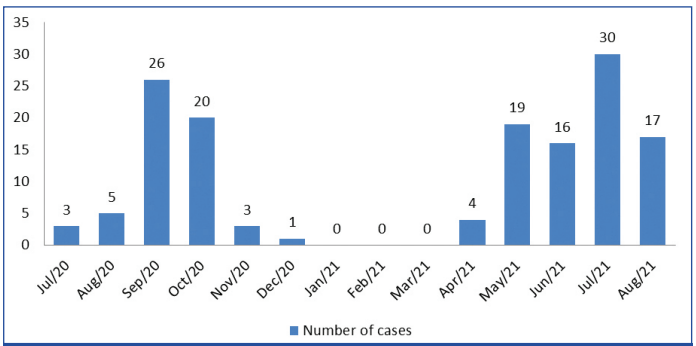
Data collection and analysis were done from the Medical Record Department of Dedicated COVID-19 Hospital under TRIHMS, Naharlagun, Arunachal Pradesh, India. Details of patients like age, parity, gestational age, co-morbid conditions, COVID-19 disease severity, ICU admissions, mode of delivery, maternal deaths, neonatal birth weight, Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score, NICU admissions and neonatal outcomes were noted. All women were tested by deep nasopharyngeal swab sampling as per Indian Council of Medical Research (ICMR) guidelines [11]. Women were categorised into mild/moderate/severe disease and managed according to the Ministry of Health and family Welfare, Government of India treatment guidelines [12]. Neonatal swab test were sent within 24 hours of birth and rooming-in was recommended. Direct breastfeeding was also encouraged and mothers were instructed to wear mask and perform hand hygiene before close contact with the baby.

STATISTICAL ANALYSIS

The data entry was done in Microsoft Excel spreadsheet and the Statistical analysis was done with Statistical Package for the Social Sciences (SPSS) version 28.0 (SPSS Inc., Chicago, IL, USA). Categorical variable were expressed as number (n) and percentage (%). Continuous variable was done as mean±Standard Deviation (SD) and median values. Chi-square test was used for comparison of categorical variables between the groups. Student's Independent-Samples t-test was used for continuous variables like age, gestational age and duration of hospital stay. A 2-tailed "p<0.05" was considered as statistically significant.

RESULTS

A total of 144 COVID-19 pregnant women admitted from July 2020 to August 2021 were included in the study. Of 144 patients, 58 were in first wave and 86 in second wave of COVID-19 [Table/Fig-1]. All women had singleton pregnancy and no case of multiple pregnancy were reported in present study.



[Table/Fig-1]: Number of COVID-19 pregnant women admissions.

Mean age of pregnant patients in first wave was 27.24±5.75 years while that of second wave was 26.73±5.1 years. The median gestational age at admission was 39.5 weeks in first wave and 40 weeks for second wave. As many as 29 (50%) women in first wave and 50 (58.1%) in second wave had co-morbidities [Table/Fig-2].

The number of moderate and severe COVID-19 cases and ICU admissions were significantly higher in the second wave when compared to first wave. Most of the patients with asymptomatic to mild cases were managed on room air in both the study groups.

Parameters	1st wave (n=58)	2nd wave (n=86)	Test	p-value
Age (years)				
Mean age (±SD)	27.24 (±5.75)	26.73 (±5.1)	t-test	0.578
≤20	8 (13.8%)	12 (14%)		
21-25	22 (37.9%)	31 (36%)		
26-30	16 (27.6%)	26 (30.2%)		
31-40	12 (20.7%)	17 (19.8%)		
Parity				
Primigravida	20 (34.5%)	38 (44.2%)	χ^2 test	0.244
Multigravida	38 (65.5%)	48 (55.8%)		
Mean age in weeks	37.28±8.028	34.86±8.40		
Median gestational age in weeks at admission [Min-max]	39.5 [7-42]	40 [5-41]	t-test	0.087
Associated co-morbidities				
Anaemia	15 (25.9%)	25 (29.1%)	χ^2 test	0.68
Gestational hypertension	8 (13.8%)	14 (16.3%)		
Severe preeclampsia	2 (3.4%)	3 (3.5%)		
Gestational diabetes	1 (1.7%)	2 (2.3%)		
Hypothyroidism	0	1 (1.1%)		
Hepatitis B	3 (5.2%)	5 (5.8%)		
Total	29 (50%)	50 (58.1%)		

[Table/Fig-2]: Baseline demographic characteristics.

High Flow Nasal Cannula (HFNC) oxygen therapy was used for all the moderate to severe cases. Three (3.4%) patients in second wave needed mechanical ventilation. The mean duration of hospital stay was 7.64±2.07 days in first wave and 11.13±3.29 days in second wave and it was statistically significant [Table/Fig-3].

Parameters	1st wave (n=58)	2nd wave (n=86)	Test	p-value
Severity of COVID-19 symptoms				
Mild/Asymptomatic	51 (87.9%)	60 (69.8%)	χ^2 test	0.015
Moderate	7 (12.1%)	20 (23.3%)		
Severe	0	6 (7%)		
ICU admissions	1 (1.7%)	11 (12.7%)	χ^2 test	0.02
Mechanical ventilation	0	3 (3.4%)	-	-
Mean duration of hospital stay in days	7.64±2.07	11.13±3.29	T test	<0.001

[Table/Fig-3]: Clinical presentation and COVID-19 severity.
A p-value <0.05 is considered to be statistically significant

A total of 54 (93.1%) in first wave and 63 (73.3%) in second wave had outcome of singleton delivery. Four (6.9%) in first and 23 (26.7%) in second wave were undelivered and they were discharged in antenatal period after treatment by COVID-19 management protocol.

In first wave, 41 (76%) had caesarean section and 13 (24%) had vaginal delivery which were comparable to 42 (66.7%) caesarean section and 21 (33.3%) vaginal delivery in second wave. In present study, caesarean sections were done for mostly obstetrics indications only. There were three maternal deaths due to COVID-19 pneumonia and respiratory failure in second wave compared to none in first wave [Table/Fig-4].

First case was a multigravida at 20 weeks of gestation with severe COVID pneumonia and died within five days of ICU admission in antenatal period. Other two cases were multigravida at term with severe COVID pneumonia and refractory hypoxia. Caesarean section were done for both after multidisciplinary team decision with intention of saving the baby and improvement of maternal condition after delivery, but both patients died on third post operative day on mechanical ventilation. Both the babies were admitted in NICU, but one of them died on second postnatal day.

Parameters	1st wave (n=58)	2nd wave (n=86)	p-value (χ^2 test)
Total no. of deliveries	54 (93.1%)	63 (73.3%)	0.003
Undelivered and discharged	4 (6.9)	23 (26.7)	
Mode of delivery			
Vaginal delivery	13 (24%)	21 (33.3%)	0.31
Caesarean section	41 (76%)	42 (66.7%)	
Indication of caesarean section			
- Previous CS	11 (26.8%)	12 (28.5%)	0.85
- Cephalopelvic disproportion	4 (9.7%)	5 (11.9%)	0.75
- Severe preeclampsia	2 (4.8%)	4 (9.5%)	0.41
- Oligohydraminos	6 (14.6%)	3 (7.1%)	0.27
- IVF pregnancy	1 (2.4%)	2 (4.7%)	0.57
- Foetal distress	8 (19.5%)	6 (14.2%)	0.52
- Maternal request	1 (2.4%)	2 (4.7%)	0.57
- Failed induction of labour	5 (12.1%)	6 (14.2%)	0.77
- Malpresentation	3 (7.3%)	2 (4.7%)	0.62
Abortion	3 (5.1%)	2 (2.3%)	0.36
Preterm delivery	5 (8.6%)	7 (8.1%)	0.91
Postpartum haemorrhage	2 (2.3%)	3 (3.4%)	0.99
Maternal deaths	0	3 (3.4%)	0.273

[Table/Fig-4]: Maternal outcomes.

In both the groups, majority of neonates had birth weight more than 3 kg. APGAR score was normal (7-10) in most of the neonates in both the groups. Resuscitation was given to all low APGAR score ≤6 in both the study groups, 2 (3.7%) in first and 4 (6.3%) in second wave. In first wave, one Intrauterine Foetal Death (IUFD) happened in unbooked primigravida at 34 week with severe preeclampsia and HELLP syndrome (Haemolysis, Elevated Liver enzymes, and Low Platelets) with mild COVID-19. Four IUFD were seen in second wave, three of them had moderate symptoms with high fever and chills and were diagnosed with IUFD at admission. Fourth case was multigravida who refused caesarean section for post-term with severe oligohydraminos and suffered IUFD during intrapartum period. Eight (14.8%) neonates in first wave and 12 (19%) neonates in second wave required NICU admissions due to various reasons of low birth weight, low APGAR score, meconium aspiration syndrome and birth asphyxia. In first wave, one baby died on second day postnatal period of unknown cause. Two babies in second wave had early neonatal death in NICU for severe hypoxic ischaemic encephalopathy and meconium aspiration syndrome. All the neonates tested negatives for SARS CoV-2 COVID-19 in both the study groups [Table/Fig-5].

Parameters	1st wave (n=54 deliveries)	2nd wave (n=63 deliveries)	p-value (χ^2 test)
Birth weight (kg)			
>3	31 (57.4%)	37 (58.7%)	0.88
2.5-2.9	15 (27.7%)	17 (26.9%)	0.92
2-2.4	6 (11.1%)	8 (12.6%)	0.79
1.5-1.9	2 (3.7%)	1 (1.5%)	0.47
Apgar score at 1 minute			
7-10	51 (94.4%)	55 (87.3%)	0.18
4-6	2 (3.7%)	3 (4.8%)	0.77
0-3	0	1 (1.6%)	-
IUFD	1 (1.9%)	4 (6.3%)	0.37
NICU admission	8 (14.8%)	12 (19%)	0.62
Neonatal SARS-CoV-2 COVID 19 positive test at birth	0	0	-
Early neonatal death	1 (1.8)	2 (3.1%)	0.47

[Table/Fig-5]: Neonatal outcomes (54 neonates in 1st wave and 63 neonates in 2nd wave).

DISCUSSION

Worldwide, SARS-CoV-2 has taken its toll on healthcare systems and potentially on maternal and foetal outcomes.The advent of second wave in year 2021 showed a dramatic apparent increase in severe or critical illness, ICU admissions and maternal deaths among COVID-19 pregnant women all over the world [10,13,14]. The virulent Delta variant (B.1.617.2) of the SARS-CoV-2 virus of second wave was found to be the cause of more severe disease, with an increase in transmissibility and vaccine-breakthrough infections [15,16].

In the present study, more patients were found to be admitted during the second wave in agreements with other published reports [13,14]. The mean age group was 27.24 (±5.75) years in first and 26.73 (±5.1) years second wave which was comparable with 29.7 years of study by Metz TD et al., [17]. Allotey J et al., in their meta-analysis reported adverse outcomes among pregnant patients with pre-existing co-morbidities. Metz TD et al., also suggested pregnant and postpartum patients with SARS-CoV-2 to be significantly increased risk of a composite of death and serious obstetric morbidity related to hypertensive disorders of pregnancy, postpartum haemorrhage and other infections compared with individuals without SARS-CoV-2 infection [8,17]. Present study also demonstrated high pregnancy associated co-morbidities like anaemia, gestational hypertension and other medical disorders in both waves (50% vs 58.1%) though it was not statistically significant on comparison between groups. This high co-morbidity probably was because of inclusion of anaemia in both the groups (25.9% vs 28.1%) as anaemia is prevalent more in our northeast region of India.

Present study demonstrated a higher frequency of severe cases, ICU admissions, need of mechanical ventilation, longer duration of hospital stay and maternal deaths during the second wave compared to first wave of COVID-19. This findings were quite similar with the other studies and meta-analysis [10,13,16]. In present study, 11 patients in second wave needed ICU admissions and out of which 3 (3.4%) needed invasive ventilation but succumbed to death due to COVID-19 related refractory hypoxia and respiratory failure. Mahajan NN et al.,reported a significantly higher ICU or High Dependency Unit (HDU) admission of 45 (11.6%) compared to 27 (2.4%) in first wave with high maternal mortality rate of 83.3 per 1000 births in second wave [10]. Seasely AR et al., also reported significant increase in severe-critical disease, ICU admission, intubation and pharmacologic treatment in the Delta cohort [18]. Only contradiction was a study from Spain which cited marked increase in hospital admission among pregnant women compared with first wave, but no mortality was reported [14]. One of the reasons for high morbidity and mortality during second wave other than delta strain virulence and high transmissibility can be attributed to the non vaccination of pregnant women in India before July 2021 as it was not approved for pregnancy.

In the present study, most of the women presented at gestational age ≥37 weeks with median gestational age at admission of 39.5 weeks in first and 40 weeks in second wave. The mean gestational age at presentation by Chen H et al., and Mahajan NN et al., were 260±14 days and 273 days, respectively [6,10]. Reports from China and systematic review by Khalil A et al., published higher incidence of caesarean section, mostly done for COVID-19 severe maternal pneumonia and fear of sudden maternal decompensation [6,19]. Present study also showed higher number of caesarean delivery in first and second wave (76% and 66%), although indication were only for obstetrical reasons. Present study found no increase in abortion and preterm delivery which was comparable with meta-analysis by Chmielewska B et al., [20]. But there were reports of increase preterm delivery risk among COVID-19 pregnant women by few systematic review by Allotey J et al., and Khalil A et al [8,19].

Mahajan NN et al., reported a stillbirth rate of 15.3 and 34.1 per 1000 births respectively for first and second wave, which were not

significant on comparison [10]. Present study demonstrated four IUFD of which cause of two intrauterine death were known but other two could not be ascertained as they were unbooked and had IUFD at admission. Allotey J et al., reported higher risk of NICU admission (odds ratio 4.89, 95% confidence interval 1.8-12.8) than women without COVID-19 [8]. Another study by Seasely AR et al., reported significantly higher NICU admission among delta cohort than pre-delta period [18]. In this study, NICU admissions were comparable and not significant between study groups.

The data for vertical transmission is limited. One systematic review by Kotlyar AM et al., reported SARS-Cov-2 positivity in neonate of 2% by nasopharyngeal swab, 2.9% in neonatal cord blood, 7.7% of placental samples, 9.7% of rectal swabs and 3.7% in neonatal IgM serology [21]. Present study found no SARS-CoV-2 test positivity among the neonates, even though some of the baby born to severe pregnant women needed NICU admissions. However, authors recommend further studies on vertical transmission and long term follow-up of these babies to see any delayed effects is necessary. The findings of present study supports and suggest vaccination to pregnant and lactating women during the ongoing COVID-19 pandemic.

Limitation(s)

Present study lacks age matched comparison between the groups. Present study data was limited to a single centre only and hence it cannot be generalised to the whole population.

CONCLUSION(S)

More severe cases, ICU admissions, longer duration of hospital stay and maternal deaths were observed in second wave of COVID-19 in comparison to first wave. Vertical transmission was also not found. More studies are recommended with larger samples size to assess the effect of COVID-19 on pregnancy and neonatal outcomes.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Obstetrics and Gynaecology, Tomo Riba Institute of Health and Medical Sciences, Naharlagun, Arunachal Pradesh, India.
2. Assistant Professor, Department of TB and Respiratory Diseases, Tomo Riba Institute of Health and Medical Sciences, Naharlagun, Arunachal Pradesh, India.
3. Assistant Professor, Department of Pharmacology, Tomo Riba Institute of Health and Medical Sciences, Naharlagun, Arunachal Pradesh, India.
4. Associate Professor, Department of Obstetrics and Gynaecology, Tomo Riba Institute of Health and Medical Sciences, Naharlagun, Arunachal Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Goter Doke,
Assistant Professor, Department of Obstetrics and Gynaecology, TRIHMS,
Naharlagun-791110, Arunachal Pradesh, India.
E-mail: dokegoter@gmail.com

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