Comparative study of feto-maternal outcome during 1st and 2nd wave of COVID-19 in department of obstetrics and gynaecology at a tertiary health care centre, South Gujarat

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Abstract:

Background: Initial data of COVID 19 in pregnancy from first wave (till first half of 2020) were reassuring but since September 2020, picture changed showing pregnancy as a significant risk factor for severity of illness and adverse feto- maternal outcome. **Objectives:** The aim of this study is an attempt to compare and contrast the outcomes of two waves in pregnant women from western India. **Methods:** Data was collected from retrospective review of case papers and labour room case record forms of individual patients during 1st and 2nd wave and secondary data analysis was done. All the maternal and neonatal parameters were analysed using descriptive statistics - SPSS 23 software. **Results:** Out of total of 404 COVID-19 positive pregnant women, 141 (34.9%) were symptomatic. In 1st wave, 23.5% pregnant women were symptomatic compared to 70.3% in 2nd wave. There was no significant difference noted between mode of delivery (normal delivery v/s LSCS) in both waves. A statistically significant difference was noted in rates of preterm vaginal birth between two waves i.e. 1.2% in first and 8.8% in second wave (p-value: 0.002) and still-birth rate i.e.2.0% and 10.5% (p=0.008). In first wave, 16% patients were severe to critically ill and required advanced oxygen support as compared to 63.2% of the patients in second wave (p value < 0.001). Maternal mortality due to COVID- 19 disease was 10.3% and 59% respectively. **Conclusion:** In second wave, the number of symptomatic pregnant women, maternal morbidity and mortality and adverse neonatal outcomes were significantly higher than in first wave.

Keywords: COVID 19, pregnancy, first wave, second wave, feto-maternal outcome.

The unprecedented emergence of Corona Virus Disease of 2019 from the Wuhan city of Hubei province of Chinese republic since December 2019 has taken a heavy toll on healthcare system and has crippled economy worldwide. It has been more than a year now since the global pandemic of COVID-19 hit the Indian sub-continent putting nearly 138 crore people at risk. Till today clinical knowledge, management protocols and treatment guidelines are changing frequently as more and more scientific data is coming in from different countries.

COVID-19 is caused by SARS-CoV-2, an enveloped single stranded RNA virus belonging to β-sub group of coronaviruses. Mode of transmission is close human-human contact through respiratory droplets and aerosols. Incubation period is around 2-14 days.[1] SARS-CoV-2 has a transmission rate higher than other coronaviruses probably due to genetic recombination of S-protein on receptor binding domain (RBD) of SARS.[2]

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As we write this article, the global toll has crossed 17 Cr cases and in India the number has crossed 3.46 cr with 4.69 L deaths.[3] Our hospital, reported its first COVID-19 positive obstetric case on 11thApril 2020 and since then the numbers are ever increasing. At the beginning of first wave, there were lot of speculations regarding outcome of obstetric patients with COVID-19. Pregnancy is an immune-compromised state with all its physiological changes. Previous pandemics like 1918 Spanish flu, H1N1 pandemic of 2009, SARS, Middle East Respiratory Syndrome (MERS) of 2012, have all shown that pregnant women are highly susceptible to the infection with 50% of the cases requiring ICU care and mortality rates above 25%.[4,5]

Initial data from first wave (till first half of 2020) were reassuring showing that pregnant women are not at increased risk of contracting infection than general population and severity and mortality rates were much lower than expected. A study from US showed death from COVID-19 in pregnancy was low (0·19%) and nearly same as non-pregnant women (0·25%).[6] But since September 2020, picture changed showing pregnancy as a significant risk factor for severity of illness, with critical care admission odds ratioof 2·13 (95% CI 1·53–2·95) and odds ratio of 2·59 (2·28–2·94) for requirement of invasive ventilation for pregnant women with and without COVID-19.[7] Our study is therefore, an attempt to compare and contrast the outcomes of two waves in pregnant women from western India.

Materials and methods

Department of obstetrics and gynaecology at Government Medical College and New Civil Hospital, Surat is the highest referral centre and a designated COVID-19 hospital catering to all districts in South Gujarat. We had the opportunity of managing pregnancies complicated with COVID-19 for our registered as well as referred patients along with non-COVID pregnancies.

Triaging of all pregnant women seeking healthcare facility or delivering at our centre was done on admission by clinical parameters and testing for COVID-19 disease either by RT-PCR or rapid antigen testing was done as per existing ICMR guidelines at that time.

Sample size for the study was not calculated as it would depend on the incidence and number of cases during the study period. First wave of COVID-19 disease was from April 2020 to December 2020 and second wave from March 2021 to May 2021. Data was collected from retrospective review of case papers and labour room case record forms of individual patients. Secondary data analysis was done retrospectively after Institutional Ethical clearance was obtained for the study. Detailed study of various demographic characteristics, clinical parameters, management and outcomes was done. A multidisciplinary approach with inputs from internal medicine, pulmonary medicine and infectious diseases experts, anaesthetists and neonatologists was formulated for the cases. Management was done as per existing guidelines given by AIIMS/ICMR-COVID-19 National Task Force/Joint Monitoring Group and references from timely literature published by RCOG, ACOG and FOGSI.

All the maternal and neonatal parameters were analysed using descriptive statistics and percentages and proportions were calculated. SPSS 23 software was used for data analysis. The chi-square test and fisher's exact test was used to compare variables in COVID-19 positive group of first and second wave. P- value of less than 0.05 was considered significant.

Results

In our study, total number of subjects enrolled was 404 over the entire study period. During the first wave total number of patients was 276 where as in second wave it was 128. In the first wave highest cases were noted in the month of July 2020 i.e. 78 and in second wave, month of April 2021 showed a peak of 55 cases depicted in figure1. These cases were obstetric patients with confirmed COVID 19 infection who were either our registered or referred to our centre for further management. Majority of them were intra-natal, 60.9% in first wave and 56.2% in second wave. However, this difference in period of gestation of cases (intra-natal and postnatal v/s antenatal) in first wave and second wave was not significant statistically (chi-square: 0.8 and p value: 0.4). Percentage of abortion or early pregnancy loss was higher in first wave (3.2%) compare to second wave (1.5%).

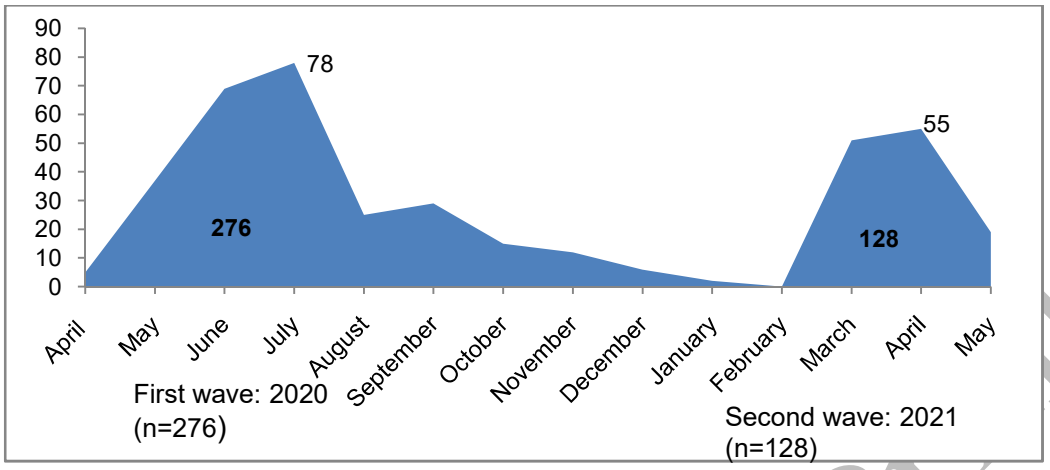

Figure 1: Month-wise trend of number of pregnant women with COVID-19 during first wave and second wave at our centre

In terms of pregnancy outcomes, in the form of mode of delivery in Covid-19 positive pregnant mother, normal delivery was preferred in both waves as shown in table 1. Lower segment caesarean section (LSCS) was done whenever it was obstetrically indicated or when pregnancy hampered supportive care of critically ill mothers. Caesarean section rate in first wave was 45.9% and in second wave it was 40.3% of total deliveries. There was no significant difference noted between mode of delivery (normal delivery v/s LSCS) in both waves (chi-square:0.6, p value: 0.4). Furthermore, a statistically significant difference was noted in rates of preterm vaginal birth between two waves i.e. 1.2% in first and 8.8% in second wave (p-value: 0.002, fisher exact test).

Table 1: Comparison of pregnancy outcome in first wave and second wave (First wave n=146, Second wave n=57)

Outcome	1 st wave	2nd wave
PTVD	2(1.2%)	5(8.8%)
LSCS	67(45.9%)	23(40.3%)
FTVD	77(52.7%)	29(50.8%)
Total	146	57

PTVD - Preterm vaginal delivery; PTVD – Full term vaginal delivery; LSCS – Lower segment caesarean section.

As depicted in figure 2, in first wave, out of total 146 births, live birth rate was 97.9% in COVID-19 positive mothers which was comparable to 97.4% live birth rate amongst COVID-19 negative mothers. But in second wave the live birth rate and still-birth rate between COVID-19 positive (10.5%) and negative (3.3%) was significantly different with a p-value of 0.003. Also, on comparing still-birth rate amongst COVID-19 positive mothers of first (2.0%) and second (10.5%) waves, there was statistically significant difference noted (chi-square = 6.9, p=0.008).

In first wave, overall early neonatal death rate was 6.1% and in second wave 2.0% at our centre as shown in table 2. Amongst COVID-19 positive mothers, early neonatal death rate was 5.4% in first wave (88.5% of total) and none in second wave. Out of total of 404 COVID-19 positive pregnant women enrolled in our study, 141 (34.9%) were symptomatic. In first wave, 23.5% pregnant women were symptomatic compared to 70.3% in second wave. This difference was statistically significant with chi-square value of 49.3 and p=<0.001.

Table 2: Comparison of COVID 19 positive status of mother and early neonatal death in first wave and second wave.

Categories	1st wave	2nd wave
Overall early neonatal death rate	6.1%	2%
Early neonatal death rate in COVID positive mothers	5.4%	-

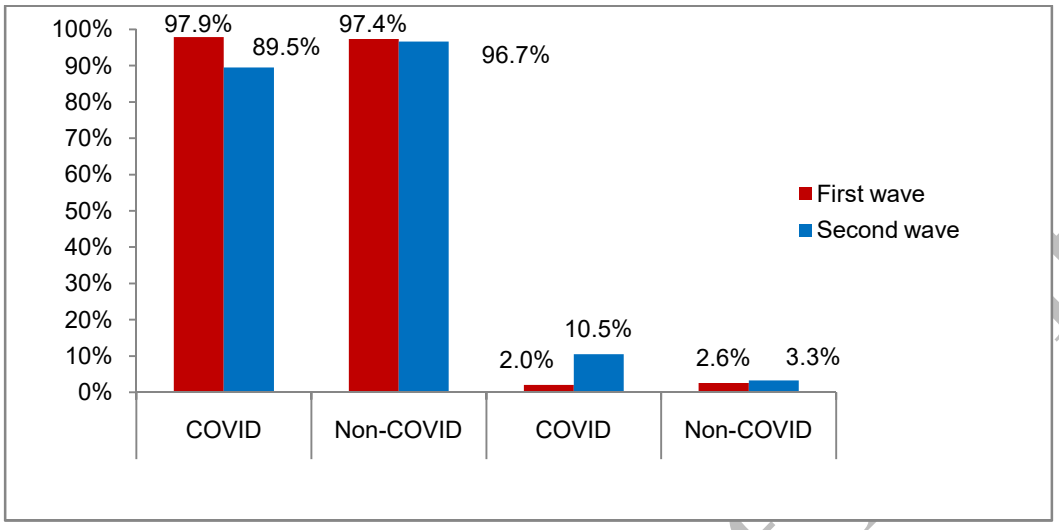

Figure 2: Comparison of neonatal outcome in first wave and second wave (First wave n=148, excluding 9 abortions and second wave n=57, excluding 2 abortions); (Total delivery 146, including 2 twins).

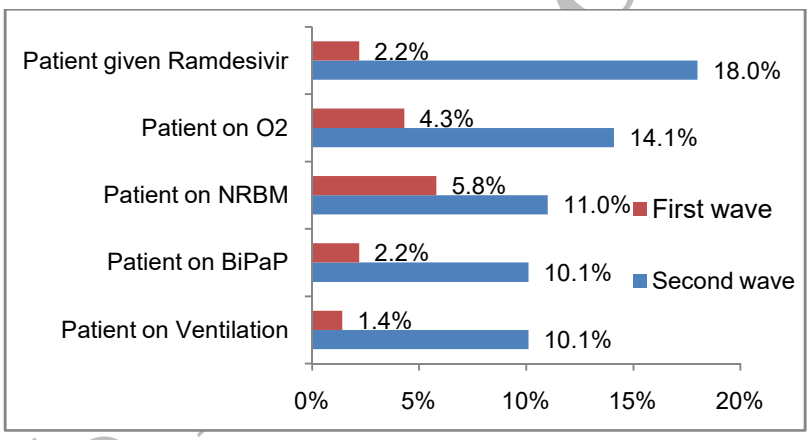

Figure 3: Comparison of management in COVID 19 positive pregnant women in first wave and second wave

In first wave, 16% patients were severe to critically ill and required advanced oxygen support as compared to 63.2% of the patients in second wave as depicted in figure 3 (p value less than 0.001). In our study in second wave, more number of patients were on ventilation, Bi-pap, NRBM, O2 support and required remdesivir compared to first wave. Maternal mortality due to COVID-19 disease was 10.3% in first wave and 59% in second wave.

As depicted in figure 4, common causes of maternal mortality in first wave (58.6%) were direct pregnancy related causes like hypertensive disorders of pregnancy, haemorrhage and sepsis. Maternal mortality due to COVID- 19 disease was 10.3% whereas in second wave 59% of maternal deaths were due to COVID-19 disease. This difference was statistically significant with p-value less than 0.001 and chi-square: 13.8.

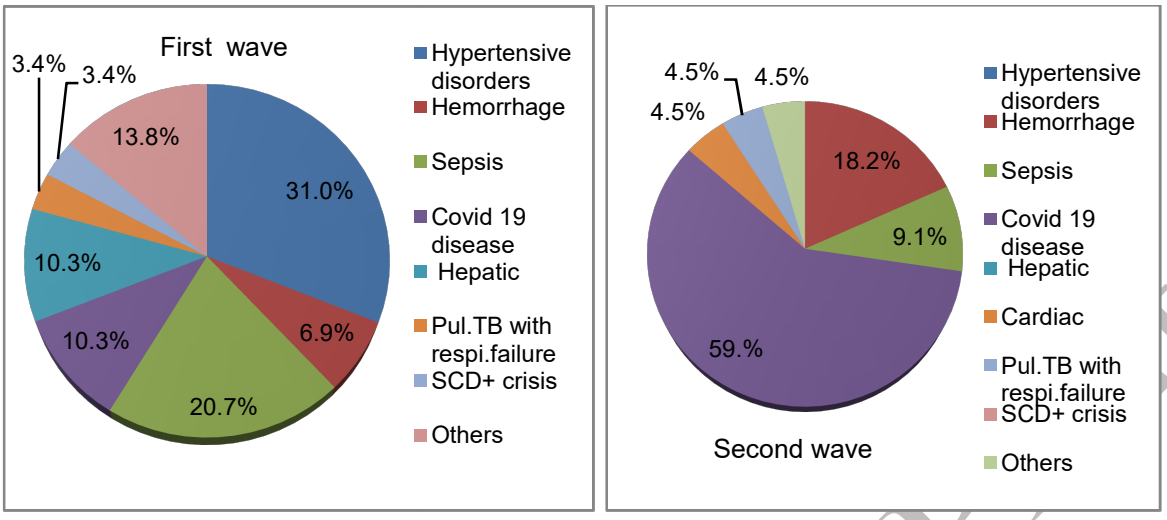

Figure 4: Distribution of causes of maternal mortality in two waves during study period

Discussion

As we write this article to share our experience of first and second wave of COVID-19 pandemic, India stands vulnerable to the expected third wave. However, situation is now more unpredictable as infection rate, morbidity and mortality rates are uncertain due to lifted lockdown restrictions and functioning of all non-essential establishments and on the other hand increasing percentages of vaccinated individuals and sero-prevalence in general population. According to CoWin Dashboard, around 80% of Indian adult population has received atleast first dose of vaccination.[8] Onus of first wave was on alpha strain (B.1.117) of SARS-CoV-2 virus and that of second wave was attributed to delta variant (B.1.617.2) and delta plus variant or the triple mutant (B.1.618). Due to changes in configuration of spike proteins, newer variants would be mutated versions of delta strains.[9]

In the year 2020, there were total 7541 obstetric admissions and 5745 total deliveries, out of which 276(3.65%) were COVID-19 infected admissions and 146 (2.54%) were deliveries of COVID-19 positive mothers. Higher percentages were seen during second wave with 9.56% of obstetrics admission being COVID-19 positive (128 out of 1338) and 7.15% of deliveries being of COVID-19 positive mothers (57 out of 798). Studies from UK like one by McCallum et al, have shown higher rates of pregnant or recently pregnant women acquiring SARS-CoV-2 infection, higher admission rates and critical care centre admission rates in second wave as compared to first wave.[10]

Inspite of managing COVID and non-COVID work simultaneously, there were no documented cases of hospital acquired COVID-19 infections amongst our patients. We had our institutional standard operational protocols for triaging and separately managing cases. Information was updated and shared with staff from time to time. Separate labour room, wards and operation theatre were designated for Covid-19 positive cases. Stringent infection prevention control protocols were formulated and followed.

At the beginning of pandemic last year, there was very little clarity about adverse foetal and maternal outcomes and vertical transmission in COVID-19 positive mothers, often resulting in caesarean section being the preferred mode of delivery. Studies have shown higher rates of caesarean section of around 68-70% in COVID-19 mothers often due to lower threshold in managing such cases.[11] But with the passage of time, all major institutions like RCOG, ACOG and WHO, recommended that need of caesarean section should be individualized based on obstetric indication and medical condition. We had a caesarean section rate of 45.9% in the first wave and 40.3% in the second wave.

Martinez-Perez O et al in their prospective study of COVID-19 pregnancies have shown higher rates of preterm births in COVID-19 positive mothers (13.8% v/s 6.7%, $p = 0.002$), increased risk of premature rupture of membranes at term (15.8% v/s 9.8%, $p = 0.013$) and increased admissions to neonatal intensive care unit (9.3% v/s 2.4%, $p < 0.001$).[12] In our study we had higher rates of preterm births amongst positive mothers in second wave as

compared to the first (8.8% v/s 1.2%, p 0.002). Stillbirth rates are increasing globally since the pandemic began. But whether it is directly related to COVID-19 infection or due to indirect causes like disrupted antenatal care system and reluctance to visit hospital due to fear of contracting infection, requires further detailed studies.[13] Although we had comparable live and still birth rates during the first wave, second wave showed significantly higher stillbirth rates in COVID-19 positive (10.5%) and negative mothers (3.3%)(p=0.003). Interestingly, still-birth rate amongst COVID-19 positive mothers from the two waves was also significantly higher in the second wave (2.0%vs10.5%) (chi-square= 6.9, p=0.008), which again supports that the second wave had greater impact on maternal and child health.

The possibility of association of COVID-19 positive status of mother and adverse foetal and maternal outcomes requires sound scientific evidence based on larger unbiased studies. Similar clarity is also required to know whether pregnant or recently pregnant women were more severely affected during the second wave and what to expect if we face subsequent waves of this pandemic. Few initial studies have shown that second wave had severely impacted maternal health of positive cases in terms of number, symptomatic presentations, hospital and critical care unit admissions.[14] In our study, though we had less number of patients in the second wave as compared to the first wave but the severity rates were significantly higher in the second wave (16% v/s 63.2%, p<0.001). Requirement of oxygen support through nasal cannula and non-rebreather mask (NRBM) and advanced respiratory support in form of BiPap (Bilevel positive airway pressure) and invasive ventilation was higher in second wave.

Nonetheless, adversely impacted maternal and foetal outcomes during pandemic, is a fact. Maternal mortality rate at our centre during the waves was 10.5% v/s 17.2% which included known causes like hypertensive disorders of pregnancy, haemorrhage, sepsis, systemic medical disorders apart form COVID-19. But the second wave showed a marked increase in mortality due to COVID 19 pneumonitis and subsequent respiratory failure amongst our obstetric patients (10.3% v/s 59%, p<0.001 and chi- square of 13.8). Similar results have been shared by other studies in India like Mahajan et al showed 93% of maternal deaths at their centre due to COVID-19 in second wave.[15]

Conclusion

Peak number of cases at our centre was decreased in second wave as compared to first wave possibly because during first wave there were very few designated COVID-19 hospitals and practically none in private sector and during second wave asymptomatic low risk obstetrics patients were under home isolation. In first wave, number of COVID positive neonates and early neonatal death were more compare to second wave. In second wave, still birth, pregnant mother with symptoms, number of serious patients and maternal mortality due to COVID-19 disease were significantly higher than in first wave. Possible reasons for increased adverse outcomes noted in our study could be increased severity of infection in second wave, fear of infection leading to reluctance and disrupted Antenatal services.

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