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Original Research Article

Aftermath Of COVID-19 Pandemic-A Comparative Retrospective Single Center Study During The First, Second And Third Wave Of COVID-19 In Tertiary Care Institute In North India

[1]Atul Rana, [2]Dr. Nitin Kumar, [3]Santosh Minhas, [4]Monika Jindal, [5]Aleeza Pal

[1]Junior Resident, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India
[2]Assistant Professor, Department of Pediatrics, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India
[3]Professor & Head of Department, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India
[4]Professor, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India
[5]Assistant Professor, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

Corresponding Author:
Dr. Nitin Kumar

ABSTRACT

Background: At the onset of Covid-19 pandemic, it was an unknown entity in terms of risk status of the pregnant women for fetomaternal outcome. Both fetus and pregnant women were considered as groups under special concern due to their unique physiological characteristics.

Method: A retrospective study was conducted in department of Obstetrics & Gynaecology along with Paediatrics department in Maharishi Markandeshwar Medical College and Hospital, Solan on pregnant females admitted to the Covid-19 Ward/ ICU over a period from August 2020 till 31st March 2022. Participants were included into 3 waves of pandemic based upon time of presentation and these 3 groups were further studied for the various fetomaternal parameters such as maternal age, symptom status, need for respiratory support, maternal mortality, abortions, still births, gestational age and weight of newborn and other morbidity and mortality in newborns.

Results: A total of 171 pregnant were included in the study, of whom 47, 64 and 60 were seen in 1st, 2nd and 3rd waves respectively. Majority of subjects were asymptomatic in 1st, 2nd & 3rd wave, (p=0.30). Age wise distribution of the patients showed majority subjects in the age group of 20-30 years (p= 0.94). LSCS rates in 3 waves were not different significantly (p = 0.67). Maternal mortality rates and need for respiratory support were in similar proportions in all 3 waves (p=0.71) and (p=0.73) respectively. No significant difference was seen in maternal morbidity and neonatal outcome.

Conclusion: The study showed no significant difference between the waves of Covid-19 pandemic in terms of fetomaternal outcome except no maternal mortality in 3rd wave.

Keywords: Covid-19, pregnancy, fetomaternal outcome

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INTRODUCTION

Coronaviruses are single stranded positive sense RNA viruses and are the largest family in the order Nidovirales. Bats, racoon dogs, Pangolins are the natural host of different Coronavirus subfamilies, and eating of these animals is the main route for human transmission [1, 2]. COVID-19 disease was first diagnosed in Wuhan city, Hubei province, China [3]. After the spread of infection in the entire world, it became a challenge to healthcare system [4]. The novel coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) had become a worldwide health emergency since its pronouncement as a pandemic on 11 March 2020 by the World Health Organization [5]. Though there was no definite dates were there that divided the spread into waves, but still depending upon the maximum no of cases per day, COVID-19 spread was divided into three separate waves-first wave beginning from August 2020 till the end of December 2020, second wave from April 2021 to June 2021 and third wave started from January 2022 and ended in March 2022. Empirical data showed that the traits of the aftermath of the virus do vary between these three waves. Large variance in the age groups and severity of the diseases have been reported. People with younger age group were infected in the second wave with a high fatality rate as compared to first and third wave [2]. Pregnancy being an immunocompromised state and pregnant women are more susceptible to infectious diseases like COVID-19 infection. The maternal immune system does not maintain a static immune suppressed state, rather the immunological condition changes along with growth and the development of the fetus. In early pregnancy, maternal immune system is pro- inflammatory which favors the implantation of embryo and placentation. In middle half of the pregnancy, it is anti-inflammatory which helps fetal growth, while near delivery of baby it becomes pro inflammatory which favors the parturition [6].

Though the number of COVID-19 positive patients in India were low in first and third wave to begin with the situation, surprisingly changed in second wave, when over 400,000 confirmed cases/day were reported [7].

This study depicts our experience of COVID-19 in pregnant women and analyses maternal and neonatal outcome in 1st, 2nd and 3rd wave of this pandemic.

Aims and Objectives

Aim and objective of the study were to compare feto-maternal outcome in Covid 19 positive pregnant patient in all three waves in a tertiary care Hospital in north India.

Material and method

Study design

The retrospective study was conducted by Obstetrics & Gynecology and Paediatrics departments in Maharishi Markandeshwar Medical College and Hospital, Solan on all Covid-19 positive pregnant females admitted to the Covid-19 Ward/ICU over a period from August 2020 till 31st March 2022, irrespective of their clinical profile. The patients admitted during the period August 2020 to March 2021 were considered in 1st wave, that from April 2021 till December 2021 as 2nd wave and that from January 2022 till March 2022 as the third wave of COVID 19.

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Criteria of COVID 19 testing at our institute included: all symptomatic patients, history of exposure to Covid positive persons, all pregnant patients admitted in ward and being a dedicated Covid care hospital-all Covid positive pregnant patients referred from Solan & Sirmour district.

Inclusion criteria

In this study we have included 171 pregnant patients who were admitted at our hospital with RAT/RTPCR positive irrespective of their symptom status.

Exclusion criteria

All asymptomatic pregnant women found positive on RAT/RTPCR testing, had refused for admission and opted for home isolation were not included in this study.
Data were collected from medical record department of our institution. Data included baseline characteristic, significant past medical history, obstetric history, clinical history, laboratory results, management modalities, maternal and neonatal outcome.

Statistical analysis

Collected data were analysed using SPSS version 20 and represented using percentages and categorical data was analysed using Chi square/Fisher's Exact test. P value of <0.05 was taken as statistically significant.
Ethical approval was obtained from the Institutional Ethics Committee (MMMCH/IEC/22/512).

Results

A total of 171 pregnant were included in the study, of whom 47, 64 and 60 were seen in 1st, 2nd and 3rd waves respectively. Majority of the patients were seen in the age group 20-30 years. Chi square test was done, and results were found to be non-significant (p= 0.94). (Table 1)

Table 1: Age wise distribution of Covid positive pregnant females seen in facility

Age (in years)	First wave	Second wave	Third wave	χ^2 p value
<20 years	2 (4%)	03 (4.2%)	03 (5%)	0.94
20-30 years	36 (76.5%)	51 (79.4%)	44 (73.3%)	
>30 years	09 (19.5%)	10 (16.4%)	13 (21.7%)	
Total	47	64	60	

A larger number of patients underwent LSCS compared to NVD however no significant difference was seen between the three waves of the Covid 19 pandemic ranging from 51.6% to 60% (p = 0.67). (Table 2)

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Table 2: Pregnancy outcomes in Covid 19 positive patients

Pregnancy outcome	1st wave	2nd wave	3rd wave	χ^2 p value
NVD	19 (40%)	27 (42%)	25 (41.6%)	0.67
LSCS	28 (60%)	35 (54.7%)	31 (51.6%)	
Abortion	00	02 (3.1%)	03 (5%)	
Ectopic	00	00	01 (1.6%)	

Similar profile in parity of the patients was seen among the patients presenting to the facility for safe confinement during different waves of pandemic. There was no significant difference noted among the groups (p= 0.98). (Table 3)

Table 3: Parity of patients presenting during the pandemic

Parity	First wave	Second wave	Third wave	χ^2 p value
Primi	21 (44.7%)	29 (45.3%)	28 (46.6%)	0.98
Multi	26 (63.3%)	35 (54.7%)	32 (63.4%)	

During the 3rd wave of pandemic, majority of the patients were unvaccinated 38(63%), but 15(25%) of the patients had received COVID-19 vaccination first dose and only a minor fraction had received both the doses 7 (12%). (Table 4)

Table 4: Vaccination status during 3rd wave (N=60)

Not vaccinated	38 (63%)
Received only 1st dose	15 (25%)
Received both doses	07 (12%)
Received booster dose	00

Majority of the patients in all the 3 waves were asymptomatic, more so in 3rd wave (95%) versus first and second wave (89%) with fever being a prominent symptom (6%) during the second wave however, no significant statistical difference was found in the symptom profile of the patients presenting to the facility during the three waves of the COVID-19 pandemic (χ^2, p= 0.30). (Table 5)

Table 5: Symptom profile of the patients during the various waves of Covid 19 pandemic

Maternal symptoms	First wave (47)	Second wave (64)	Third wave (60)	χ^2 p value
Asymptomatic	42 (89%)	57 (89%)	57 (95%)	0.30
Symptomatic	5 (10.64%)	7 (11%)	3 (5%)	
Fever	1 (2%)	4 (6%)	1 (1.6%)	
Cough	1 (2%)	1 (1.5%)	-	
Loss of taste	1 (2%)	-	-	
Myalgia	-	-	-	
Headache	-	-	2 (3.2%)	

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Sore throat	1(2%)	-	-	
Diarrhea	-	1 (1.5%)	-	
Shortness of breath	1 (2%)	1 (1.5%)	-	

Table 6: Maternal outcome during the 3 waves of COVID-19 pandemic

Maternal outcome		**1st wave**	**2nd wave**	**3rd wave**	**χ^2 p value**
Maternal death		01 (2%)	01 (1.5%)	00	0.71
Need of respiratory support	None	45 (96%)	61 (95.5%)	59 (98.3%)	0.83
	High flow oxygen	1 (2%)	2 (3%)	1 (1.7%)	
	Ventilator	1 (2%)	1 (1.5%)	0	
Maternal complications	PIH	0	0	1 (1.7%)	0.87
	GDM	0	0	0	
	Abortions	0	2 (3%)	3 (5%)	
	Preterm delivery	4 (8%)	8 (13%)	11 (18%)	
	IUD/still birth	1 (2%)	1 (1.5%)	1 (1.7%)	
	Anemia	11(23%)	13 (20.3%)	12 (20%)	
	Deranged LFT	0	2 (3%)	1(1.7%)	
	HELLP	0	2 (3%)	1 (1.7%)	
	IHCP	1 (2%)	2 (3%)	0	

No statistically significant difference was noted in need to respiratory support for Covid 19 positive mothers admitted to the facility during the 3 waves of pandemic (χ^2, P= 0.83) and on comparing the maternal complications among the groups during the 3 waves of pandemic (χ^2, p=0.87). Two maternal deaths were recorded with one each in first and second wave (χ^2, p=0.71) and none in 3rd wave. (Table 6)

Table 7: Fetal outcome for the COVID-19 positive patients in the 3 waves

Fetal outcome		**1st wave (N=47)**	**2nd wave (N=64) ***	**3rd wave (N=60) ***	**χ^2 p value**
Gestational Age	Term	43 (92%)	56 (87.5%)	49 (81.7%)	0.81
	Preterm	04 (8%)	08 (12.5%)	11 (18.3%)	
Birth weight	<2.5 kg	10 (21%)	10 (15%)	09 (15%)	0.32
	≥2.5 Kg	37 (79%)	52 (85%)	51 (85%)	
Fetal Growth Restriction		04 (8%)	06 (9%)	04 (6.6%)	0.58
5-minute Apgar Score	<7	03 (6%)	01 (1.5%)	04 (6.6%)	0.42
	≥7	44 (94%)	63 (98.5%)	55 (93.4%)	
NICU admission		02 (4%)	03 (4.5%)	03 (5%)	0.71
Respiratory support	On O_2	01 (2%)	0	1 (1.7%)	0.37
	On CPAP	01 (2%)	01 (1.5%)	0	
	On ventilator	0	0	0	
Neonatal jaundice		01 (2%)	03(4.5%)	02 (3.4%)	0.41
IUD (Intra- Uterine Demise)		01 (2%)	00	01 (1.7%)	0.51
*There were 2 twin deliveries in second and 4 in third wave.					

On studying the fetal outcome for the COVID-19 patients admitted to the facility in the 3 waves of pandemic, similar trends in the gestational age (Chi square, p= 0.8052) and birth weight (χ^2, p= 0.3214) were noticed with no statistical difference among the groups. No significant difference was seen in the 5-minute Apgar score of the newborns delivered to Covid 19 patients in the 3 waves of pandemic (χ^2, p= 0.4171). There was also no statistical difference among the groups for requirement of NICU admissions and respiratory support for these newborns (χ^2, p= 0.3679). One case of IUD was recorded each in 1st, 2nd and 3rd waves of pandemic with no statistical significance (χ^2, p= 0.51). No statistical difference was noted in the fetal growth restriction rates in the three waves of pandemic (χ^2, p= 0.58). (Table 7).

Discussion

Primary objective of the study was to analyse and determine if there was any significant difference in feto-maternal outcome among the 3 waves of COVID-19 pandemic. Basic demographic data like age at presentation, parity, period of gestation of the patients was similar in all the 3 waves of the pandemic with no statistical difference. Rates of LSCS among the three waves of pandemic were statistically non-significant but, a larger fraction of patients underwent LSCS as compared to normal vaginal delivery in all the 3 waves (51.6%, 54.7% and 60% respectively). This was significantly higher than the ideal rates of LSCS for the facility as recommended by WHO (10 to 15%) [8]. This could be explained by the fact that out facility was the only functioning tertiary referral centre catering for Covid 19 patients in a wide geographic area.

Most of the patients presenting to the facility in all the 3 waves of COVID-19 infection were asymptomatic 2nd wave showed larger fraction of the patients who were symptomatic as compared to 1st and 3rd wave; however, no statistical significance could be demonstrated. This contrasted with study done by Roohi A, where 1st wave had 39.1% and 2nd wave 75.2% asymptomatic subject's respectively [9].

Fever was the prominent symptom in 2nd compared to 1st and 3rd waves. Other symptoms noticed were cough, shortness of breath, headache and diarrhoea. There was no statistical difference in the symptom profile of the patients presenting in all 3 waves of the COVID-19 pandemic.

Analysis of data set for maternal outcome showed 2 cases of maternal mortality 1 each in first and second wave of COVID-19 pandemic with mortality rate <2%. No mortality was seen in 3rd wave of pandemic, this difference along with higher percentages of asymptomatic infections could be attributed to vaccination & herd immunity (if there is any); however, data analysis showed no statistical significance. This contrasted with studies done in general population in same institution by Kaur G and Naseem N which showed 28 deaths in 211 patients (Mortality = 13.2%) [10] and 17 deaths in 73 patients (mortality = 19%) [11] respectively. This could be explained by the fact that general population included elderly populace with multiple comorbidities.

Need for respiratory support was seen less in 3rd wave 1.7% as compared to second and first wave (4.5 and 4% respectively) and no ventilatory support was required in 3rd wave; however, this difference was not significant statistically. This contrasted with study done by Roohi A, which showed 20% and 30% requirement for respiratory support in 1st and 2nd wave respectively [9]. 2021, FOGSI National Registry revealed that 7.19% of pregnant women

required critical care and mortality of 1,01% (n=989) [12]. These differences may be due to our institute being a dedicated Covid centre got all Covid positive patients referred from other places irrespective of their symptom status. Incidence of pregnancy related complications like PIH, gestational diabetes, severe anemia, prematurity abortions and hepatic dysfunction in patients were noted with no significant statistical difference among the 3 waves of Covid-19 pandemic. ICMR, on 2nd July 2021 through a press release approved Covishield vaccination for pregnant women. In our study 37% of subjects were vaccinated; 25% & 12% with single and double dosages respectively. This could have contributed to the milder disease and more numbers of asymptomatic pregnant women in third wave [13].

Analysis of data for newborn born to these Covid-19 patients showed no statistical difference among the groups in terms of gestational age, birth weight, Apgar score, complications like fetal growth restriction, IUD, neonatal hyperbilirubinemia, need for NICU admission and respiratory support. Analysis of this data showed that, there was no difference in the outcome among the newborns born to COVID-19 positive mothers in three different waves; however, it could not ascertain that these newborns were at higher risk of complications compared to general population as study participants were not representative of the general population. A study done by Pirjani R demonstrated that newborns of these Covid-19 positive mothers not at higher risk for prematurity compared to those born to non-Covid infected mothers (P = 0.689), and NICU admission (P = 0.168) and neonatal sepsis (P = 0.568) [14].

CONCLUSION

Pregnancy is a state of physiological alteration involving biomechanical, hormonal, immunological functions. Biomechanical changes due to rising of diaphragm because of growing fetus leads to reduction in respiratory reserve (FRC). At the same time hormonal and immunological changes predispose the pregnant woman to infections. So, it was hypothesised that, pregnant women would be at high risk of complications due to COVID-19 infections. Also, during the early phase of pandemic newborn were considered to be in at-risk group due to their immature immune function. This study indicates that there were no significant differences in the three waves of Covid-19 pandemic for fetomaternal outcome. And at the same time, it also suggests that these patients and their newborns did not display very high rates of complications as compared to general population; though, study participants were not representative of the population due to the study design.

This study though limited in its scope due to study design and small study size tries to answer some of the questions related to fetomaternal outcome in COVID-19 infections. There is an immense amount of data available upon COVID-19 infections in pregnancy however, analyses are in early stages to comment upon long term results regarding fetomaternal outcome.

REFERENCES

1. Prabhu D, Nakum KD, Vitthal A. Fetomateranal outcome in covid 19 positive pregnancies-A prospective study. International Journal of medical and Biomedical studies, 2020, 4(12).
2. Iftime S, Lopez-Azcona AF, Vallverdu I, Hernandez Flix S, De Feber G, *et al.* First and second waves of corona virus diseases-19: A comparative study in hospitalized patients in Reus, Spain. Plos one. 2021;16(3)e024-8029.
3. Li Q, Guan X, Wu P, *et al.* Early transmission dynamics in Wuhan, China, of Novel

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Coronavirus-infected pneumonia. N Engl. J Med. 2020;382(13):1199-1207.
4. Garcia-Castrillo L, Petrino, Leach R, *et al*. European Society for Emergency Medicine position paper on emergency medical system response to COVID-19 Eur. J Emerg. Med. 2020;27(3):174-177.
5. Liu H, Liu F, Li J, Zhang T, Wang D, Lan W. Clinical and CT imaging features of the COVID-19 pneumonia: Focus on pregnant women and children. J Infect. 2020;80(5):e7-e13.
6. Liu H, wang LL, Zhao SJ, Kwak-Kim J, Mor G, Liao AH. Why are the pregnant women susceptible to COVID-19? An immunological viewpoint. J Report Immunol. 2020;139:103-122.doi:10.1016/j.jri.2020.103122.
7. COVID Live Update: Cases and Deaths from the Coronavirus-Worldometer. https://www.worldometers.info/coronavirus.
8. WHO: Caesarean section rates continue to rise, amid growing inequalities in access. https://www.who.int/news/item.
9. Roohi A, Janaki V. A study of maternal and perinatal outcomes in first and second waves of COVID-19. Indian J Obstet Gynecol Res. 2022;9(1):35-41.
10. Kaur G, S V, Sadhu R, Jindal M. A retrospective study on COVID-19 in a tertiary care rural hospital. Natl J Physiol Pharm Pharmacol. 2022;12(7):958-961. Doi: 10.5455/njppp.2022.12.12446202118122021.
11. Naseem N, Thakur R, Sadhu R, Jindal M. Presentation, Clinical Course and Outcome in Hospitalized Patients with Covid-19: A Retrospective Study. Alq J Med App Sci. 2022;5(1):39-42.
12. Gandhi AM, Ganatra AM, Tank P. Preliminary Results from the FOGSI's National Registry on Pregnancy with COVID-19. J Obstet Gynecol India. 2021;71:361-368.
13. MoHFW. Pregnant women now eligible for COVID-19 vaccination, 2021. Accessed December 16, 2022. https://www.pib.gov.in/Press ReleasePage.aspx?PRID=1732312
14. Pirjani R, Hosseini R, Soori T, Rabiei M, Hosseini L, Abiri A, *et al*. Maternal and neonatal outcomes in COVID-19 infected pregnancies: a prospective cohort study. J Travel Med. 2020 Nov;27(7):taaa-158.