



# The Study of Covid 19 Infection in Pregnancy in a Government Hospital Setup in Goa

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## ABSTRACT

### Background:

Coronavirus disease 2019 and was declared an outrageous global pandemic in March 2020. Pregnant women are more susceptible to COVID-19 because the physiologic changes of pregnancy involve mostly the cardiorespiratory and immune systems. This study was done amidst the first and the second wave in the state of Goa, and we have made a novel attempt in portraying the characteristics of the virus on the pregnant population during both the waves and made an honest comparison of its outcomes on this specific population.

### Materials and methods:

We conducted a descriptive and a retrospective study across the various government hospitals in Goa over a period of one year and seven months with a sample size of 260 confirmed Covid -19 positive pregnant woman. The data was collected using a WHO questionnaire .Data collection in this study particularly included. 1] age 2] symptomatic/asymptomatic 3] clinical features 3] parity 4] gestation 5] associated conditions 6] mode of delivery 7] supportive care 8] pregnancy outcomes 9] maternal mortality 10] neonatal outcome 11] covid vaccination 12] covid wave 1(April 2020-april 2021) / covid wave 2 (April 2021- November 2021) in the state of goa.

Results: 260 participants were studied and the characteristics of both waves were compared. The analysis revealed that most of the patients were non vaccinated(100%) asymptomatic (68.1%), young (43.8%) ,multigravida(56.5%) patients who presented at term with fever accounting for 10.8% in symptomatic women. With respect to adverse outcomes in pregnancy and fetus, maximum association was with gestational hypertension/preeclampsia/HELLP being 11.9%, preterm labor& oligohydrannios 6.9% and IUGR at 2.3%. Also 68% delivered vaginally, 30% underwent a c-section and 1.2% had a VBAC with 6 women requiring ICU and ventilatory support to which they eventually succumbed to. Neonatal outcomes revealed that 1.7% expired, 3% had NICU admissions and 95% were healthy babies with stillborn and abortions being 2.8% .The

second wave saw more symptomatic women, ICU admissions and maternal mortality.

Conclusion:The successful mantra to cut off the chain of transmission of this SARS-Cov2 include implementation of preventive measures like regular hand hygiene, maintaining social distancing, following respiratory etiquettes, staying at home, and disinfecting contaminated surfaces; for all these educational materials can also be developed and distributed.

**Keywords** COVID-19 • Pandemic • Pregnancy • Mortality •Goa

## I. INTRODUCTION

Coronavirus disease 2019 and was declared an outrageous global pandemic in March 2020. It's an evolving infectious disease with an upsurge in cases and deaths and was first being reported in China, in December 2019. Before being declared a pandemic by WHO on 11.3.2020, this disease has alarmed the public health systems, stating rules and actions by leaders across the world, including lock- downs for posing a hurdle on movement and bringing about directives for suppressing the transmission. India was not any exception; it reported its first case of the COVID- 19 on 30 January 2020 and imposed a nationwide lockdown. The increasing mortality rate with SARS- CoV2 necessitates recognizing and safeguarding vulnerable populations in society such as pregnant patients as a crucial step in its management. Pregnant women are known to be inadvertently affected by respiratory ailments, with associated higher infectious morbidity and maternal mortality rates. Thus, it is important to study the virus and its implication, and augment directives for preparedness of the maternity services for the long journey against this relatively unknown entity. Clinical manifestations range from being completely asymptomatic to mild upper airway infection, to severe and fatal cases with pneumonia and acute respiratory failure. The changes in the immune system of pregnant women make them more susceptible to infectious processes, with the risk of adverse maternal and neonatal complications, premature birth, spontaneous abortion, restriction of intrauterine growth, hospitalization in an intensive care unit, renal



failure, intravascular coagulopathy, and transmission to the fetus or newborn. Covid-19 infection is not considered an absolute indicator for immediate pregnancy termination, with caesarean section done only for obstetrical indications. This study was done amidst the first and the second wave in the state of Goa, and we have made a novel attempt in portraying the characteristics of the virus on the pregnant population during both the waves and made an honest comparison of its outcomes on this specific population. The goal was to study the characteristics and outcomes of deliveries in covid-19 positive mothers with objectives being to study the characteristics of covid-19 infection in pregnancy, to study the obstetrical outcomes of covid-19 positive pregnant mothers, to study the risk of vertical transmission, to compare the outcomes of the first and second covid wave.

## II. MATERIALS AND METHODS:

Our study design was descriptive study, retrospective study. Our study was set up in hospital based, in the department of obstetrics and gynecology, goa medical college, subdistrict hospital ponda, esi hospital margao. over a duration of one year and seven months after ethics approval with a sample size of 260 using census method. The patients antenatal, delivery and postnatal records were assessed using a structured who questionnaire. Our inclusion criteria was all confirmed covid-19 positive pregnant woman detected through rtPCR, covid antigen test, truenat test. Our exclusion criteria: nil. Data was collected from patients antenatal, delivery and postnatal records from government covid hospitals of goa using a who questionnaire as mentioned below. Data collection in this study particularly included: age, symptomatic/asymptomatic, clinical features, parity, gestation, associated conditions, mode of delivery, supportive care, pregnancy outcomes, maternal mortality, neonatal outcome, covid vaccination, covid wave 1 (April 2020-April 2021) / covid wave 2 (April 2021-November 2021) in the state of goa. The data obtained was entered into a pre-designed semi-structured study WHO proforma data was entered in Microsoft Excel and analyzed using the SPSS software version 22. Categorical and quantitative data were expressed as percentage and mean  $\pm$  2sd respectively.

## III. DISCUSSION AND RESULTS

The present study included a total of 260 participants based on the requirements of our inclusion and exclusion criteria. Also 260 participants were studied into two giant waves over a time frame of one year and seven months from

April 2020 to April 2021 and April 2021 to November 2021 in the state of Goa and the characteristics of both waves were compared. In our present study, to begin with as opposed to previous systematic reviews, a relatively younger age (mean age = 28 years) in women in this analysis takes us back to the concept of early age at marriage and conception which is prevalent in India. [1-5]. The results of the present study suggest that the blood group B might have a role in increased susceptibility to the COVID-19 infection. However, once infected, blood group type does not seem to influence clinical outcome. We also came across more patients being asymptomatic for the infection as in accordance with studies held by Allotey et al. and Gao YJ et al. This can be attributed to stringent lockdown guidelines, restricting movement of patients thus breaking off the chain of viral transmission. Amongst the many symptoms of the virus fever accounted for 10.8% of the cases followed by cough and sore throat as accounted in the studies of Huijun Chen et al. Also limited availability of testing kits in early days in India, may have caused less liberal testing protocols for pregnant women thus leading to many missed and undiagnosed cases which may have then resulted in catastrophic illness later. The study also showed involvement of more multiparous than primiparous patients. This can be attributed to the lockdown imposed leading to less social gathering, less wedding rituals, public gatherings causing less social interactions. The present study has included pregnancies over all gestations, however many study subjects presented to us at 36 weeks or mostly at term. This is again subjected to lesser viral testing strategies in the early days of infection and lockdown situation and psychological fear associated with the disease leading to a drop in early detection of the pregnant women with covid. This study also showed a correlation between certain associated conditions with covid-19 which were less alarming and as noted in previous studies. Findings of this study also highlighted less virulence of SARS-CoV2, with respect to adverse outcomes in pregnancy and fetus. But these observations were in striking contrast with conclusions drawn by Mascio et al., Allott et al. or Khalulet al., that COVID-19 was allied with moderately greater preterm births, preeclampsia, other maternal morbidity, and perinatal death that may be due to earlier gestational age upon acquiring SARS-CoV2, heterogeneity in clinical presentation and perinatal management amongst the included cases in that review. In our study the maximum association was with gestational hypertension/preeclampsia/HELLP being 11.9%



which is a little area of concern when the noted overall incidence of preeclampsia in general population is learned to be 8%. This throws some light on our literature justifying it by saying that covid 19 virus causes decreased ACE2 activity and imbalance between Ang II and Ang-(1-7) in preeclampsia, association of both of severe forms of COVID-19 and pregnancy hypertensive disorders with comorbidity, and interaction between immune system, inflammatory cytokines, and the reninangiotensin aldosterone system and its contribution to the hypertension pathogenesis. Preterm labor and oligohydramnios in my present study has accounted 6.9% and IUGR at 2.3%. These were in accordance with a study done by Di Mascio et al. which can be attributed to acquiring the disease at early gestation or causing inflammation thus stimulating a cytokine storm leading to preterm labor. Other comorbidities which took over was hypothyroidism, however our knowledge regarding the pathogenesis is limited due to scanty studies.

In the present study, 68% delivered vaginally, 30% underwent a c-section and 1.2% had a VBAC. Though case reports/series published so far have described mostly cesarean section as mode of delivery for gestational women, amongst the delivered women with COVID-19 positive status in the present research, LSCS was done only for obstetric indications. [6,7] This is in accordance with the national guidelines, in absence of evidence favoring one mode of birth over another.[81]. Maternal outcomes in the present study saw 6 women requiring ICU and ventilatory support to which they eventually succumbed to. Neonatal outcomes were not any different, 1.7% expired, 3% had NICU admissions and 95% were healthy babies. There were total of 2.8% stillborn and 2.8% abortions. This is in accordance with studies of Maria Claudia alzamora et al. and Sentilhes L et al. In our setting this can be attributed to the unpreparedness of the situation and lack of appropriate measures to fight the virus. In line with most of the previous investigations, only two babies were testing positive for infection, during hospital stay. But vertical transmission cannot be commented upon accurately in these cases. As per hospital policies, rooming in was practiced, and babies were breast fed; this could have led to babies getting infected. However, with subsequent testing, both babies became negative. Ideally, if symptomatic, separation from mother

should be done, But since the benefits of breast feeding are superior to its risks of transmitting SARS-CoV2 due to close contact, rooming in is recommended. [9,11] However, COVID-19 positive mothers must wear mask, and practice hand hygiene before each feed, maintaining 6 m distance when not feeding. None of the study participants were vaccinated against the virus. This is because the vaccine was discovered at a much later stage. Also, after the vaccine came into play, it being a completely new addition to the market and not much was being known about its benefits, risks and complications, many were reluctant in administering it.

The Covid virus in the hospitals of Goa were studied over two waves. The first wave starts from April 2020 to April 2021 and the second wave from April 2021 to November 2022. The most striking differences were that the second wave saw more symptomatic pregnant women, more ICU admissions and comparatively more maternal mortality. Also, the vaginal to C section were at par to each other in the first wave, whereas in the second wave as our knowledge about the virus became more extensive, protective gears were upgraded and the generalized fear amongst the health personnel vanished as they got more armed and smart the rates of C- section drastically went down and vaginal deliveries were encouraged. My study also came across women being encouraged for a vaginal delivery after C section in the second wave of covid. This is in line with a study from the United Kingdom that reports higher frequency of severe COVID-19 [12] but contrasts with a study reporting low severity of COVID-19 during the second wave in Spain.[13] Although the exact causes of the increase in severity are unknown, there is a suspicion that a highly virulent variant of concern (B.1.617) [14-17], which is now considered responsible for the second wave in Maharashtra and other parts of India, played a role. However, genome sequencing data to show the direct association of B.1.617 leading to adverse outcomes are not available, so definitive conclusions regarding the effect of the B.1.617 variant cannot be made. However, in our study we saw a rapid upsurge of cases in the second wave which may have imposed a burden on the available resources, intelligence, and manpower, which indirectly or directly may have resulted in the rise in deadly mortality witnessed in the second wave of covid 19



**Table 1: Summary of Basic Details**

<b>Basic Details</b>	<b>Mean <math>\pm</math> SD    Median (IQR)    Min-Max   </b>
	<b>Frequency (%)</b>
<b>Age (Years)</b>	28.60 $\pm$ 4.02    29.00 (26.00-31.25)    19.00 - 39.00
<b>Age Group</b>	
18-25 Years	62 (23.8%)
26-30 Years	114 (43.8%)
31-35 Years	73 (28.1%)
36-40 Years	11 (4.2%)
<b>Parity</b>	
Primigravida	113 (43.5%)
Multigravida	147 (56.5%)



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**Symptomatic (Yes)** 83 (31.9%)

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**Symptoms**

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**Basic Details**                      **Mean ± SD || Median (IQR) || Min-Max ||**  
**Frequency (%)**

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None 177 (68.1%)

Fever 42 (16.2%)

Cough 28 (10.8%)

Sore Throat 8 (3.1%)

Runny Nose 1 (0.4%)

Malaise 4 (1.5%)

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**Blood Group**

A Positive 67 (25.8%)

B Positive 111 (42.7%)

AB Positive 11 (4.2%)



O Positive 66 (25.4%)

A Negative 3 (1.2%)

B Negative 1 (0.4%)

AB Negative 1 (0.4%)

Basic Details	Mean ± SD    Median (IQR)    Min-Max    Frequency (%)
Gestational Age (Weeks)	36.58 ± 5.12    38.00 (37.00-38.00)    6.00 - 41.00

**Table 2: Summary of ASSOCIATED CONDITIONS**

ASSOCIATED CONDITIONS	Yes	No
None	100 (38.5%)	160 (61.5%)
IUGR	6 (2.3%)	254 (97.7%)
Oligohydramnios	18 (6.9%)	242 (93.1%)
Hypothyroidism	18 (6.9%)	242 (93.1%)
Preterm labor	18 (6.9%)	242 (93.1%)
Anemia	7 (2.7%)	253 (97.3%)
Previous LSCS	29 (11.2%)	231 (88.8%)
ODM/GDM	14 (5.4%)	246 (94.6%)
GHTN/HELLP	31 (11.9%)	229 (88.1%)
Dengue Fever	2 (0.8%)	258 (99.2%)
CPD	2 (0.8%)	258 (99.2%)
PFT	4 (1.5%)	256 (98.5%)
ARDS	5 (1.9%)	255 (98.1%)
ASSOCIATED CONDITIONS	Yes	No
MSAF	14 (5.4%)	246 (94.6%)
Others	17 (6.5%)	243 (93.5%)



IUGR: INTRAUTERINE GROWTH RESTRICTION  
ODM: OVERT DIABETES MELLITUS, GDM: GESTATIONAL DIABETES MELLITUS  
GHTN: GESTATIONAL HYPERTENSION  
CPD: CEPHALOPELVIC DISPROPORTION  
PFT: PERSISTENT FETAL TACHYCARDIA  
ARDS: ACUTE RESPIRATORY DISTRESS SYNDROME  
MSAF: MECONIUM STAINED AMNIOTIC FLUID

**Table 3: Summary of Outcomes**

<b>Outcomes</b>	<b>Mean ± SD    Median (IQR)    Min-Max    Frequency (%)</b>
<b>Delivered (Yes)</b>	253 (97.3%)
<b>Mode of Delivery</b>	
Vaginal	174 (68.8%)
C Section	76 (30.0%)
VBAC	3 (1.2%)
<b>Route of Delivery</b>	
Vaginal	177 (70.0%)
C Section	76 (30.0%)
<b>Pregnancy Outcomes</b>	
Live Birth	239 (94.5%)
Still Born	7 (2.8%)
Abortion	7 (2.8%)
<b>ICU Admission (Yes)</b>	6 (2.3%)



<b>Outcomes</b>	<b>Mean <math>\pm</math> SD    Median (IQR)    Min-Max   </b>
	<b>Frequency (%)</b>
<b>Maternal Mortality (Yes)</b>	6 (2.3%)
<b>Neonatal COVID Status (Positive)</b>	2 (0.8%)
<b>Neonatal Outcome</b>	
Alive	225 (95.3%)
Expired	4 (1.7%)
NICU	7 (3.0%)
<b>COVID Vaccination</b>	
Not Vaccinated	260 (100.0%)
Vaccinated	0 (0.0%)

**Table 4: Summary for Association between COVID Wave and Parameters**





Parameters	COVID Wave		p value
	First (n = 59)	Second (n = 201)	
			0.00
<b>Age (Years)***</b>	27.27 ± 4.87	29.00 ± 3.65	11
<b>Age Group***</b>			<0.001 <sup>2</sup>
18-25 Years	25 (42.4%)	37 (18.4%)	
26-30 Years	21 (35.6%)	93 (46.3%)	
31-35 Years	8 (13.6%)	65 (32.3%)	
36-40 Years	5 (8.5%)	6 (3.0%)	
<b>Parity</b>			0.84
Primigravida	25 (42.4%)	88 (43.8%)	82
Multigravida	34 (57.6%)	113 (56.2%)	
<b>Symptomatic (Yes)</b>	15 (25.4%)	68 (33.8%)	0.22
			32
<b>Symptoms</b>			0.14
None	43 (72.9%)	134 (66.7%)	63
Fever	6 (10.2%)	36 (17.9%)	
Cough	10 (16.9%)	18 (9.0%)	
Sore Throat	0 (0.0%)	8 (4.0%)	



Parameters	First (n = 59)	Second (n = 201)	value
Runny Nose	0 (0.0%)	1 (0.5%)	
Malaise	0 (0.0%)	4 (2.0%)	
<b>Blood Group</b>			0.46 7 <sub>3</sub>
A Positive	14 (23.7%)	53 (26.4%)	
B Positive	29 (49.2%)	82 (40.8%)	
AB Positive	3 (5.1%)	8 (4.0%)	
O Positive	12 (20.3%)	54 (26.9%)	
A Negative	0 (0.0%)	3 (1.5%)	
B Negative	1 (1.7%)	0 (0.0%)	
AB Negative	0 (0.0%)	1 (0.5%)	
<b>Gestational Age (Weeks)***</b>	34.44 ± 8.05	37.21 ± 3.67	0.02 3 <sub>1</sub>
<b>Associated Conditions: None (Yes)***</b>	13 (22.0%)	87 (43.3%)	0.00 3 <sub>2</sub>
<b>Associated Conditions: IUGR (Yes)***</b>	4 (6.8%)	2 (1.0%)	0.02 5 <sub>3</sub>
<b>Associated Conditions: Oligohydramnios (Yes)</b>	6 (10.2%)	12 (6.0%)	0.25 5 <sub>3</sub>
<b>Associated Conditions: Hypothyroidism (Yes)***</b>	9 (15.3%)	9 (4.5%)	0.00 8 <sub>3</sub>
<b>Associated Conditions: Preterm labor (Yes)</b>	0.38 2 (3.4%)	0 <sup>3</sup> 16 (8.0%)	□



<b>Parameters</b>	<b>First (n = 59)</b>	<b>Second (n = 201)</b>	<b>value</b>
<b>Associated Conditions: Anemia (Yes)***</b>	4 (6.8%)	3 (1.5%)	0.04 9 <sub>3</sub>
<b>Associated Conditions: Previous LSCS (Yes)</b>	5 (8.5%)	24 (11.9%)	0.45 7 <sub>2</sub>
<b>Associated Conditions: ODM/GDM (Yes)</b>	5 (8.5%)	9 (4.5%)	0.32 1 <sub>3</sub>
<b>Associated Conditions: GHTN/HELLP (Yes)</b>	9 (15.3%)	22 (10.9%)	0.36 9 <sub>2</sub>
<b>Associated Conditions: Dengue Fever (Yes)</b>	0 (0.0%)	2 (1.0%)	1.00 0 <sub>3</sub>
<b>Associated Conditions: CPD (Yes)</b>	1 (1.7%)	1 (0.5%)	0.40 3 <sub>3</sub>
<b>Associated Conditions: PFT (Yes)</b>	1 (1.7%)	3 (1.5%)	1.00 0 <sub>3</sub>
<b>Associated Conditions: ARDS (Yes)</b>	1 (1.7%)	4 (2.0%)	1.00 0 <sub>3</sub>
<b>Associated Conditions: MSAF (Yes)</b>	2 (3.4%)	12 (6.0%)	0.74 3 <sub>3</sub>
<b>Associated Conditions: Others (Yes)***</b>	8 (13.6%)	9 (4.5%)	0.03 0 <sub>3</sub>
<b>Delivered (Yes)***</b>	52 (88.1%)	201 (100.0%)	<0.0 01 <sup>3</sup>
			0.00



Parameters	COVID Wave		P value
	First (n = 59)	Second (n = 201)	
<b>Mode of Delivery***</b>			23
Vaginal	26 (50.0%)	148 (73.6%)	0.06
C Section	26 (50.0%)	50 (24.9%)	
VBAC	0 (0.0%)	3 (1.5%)	
<b>Pregnancy Outcomes</b>			83
Live Birth	47 (90.4%)	192 (95.5%)	1.00
Still Born	1 (1.9%)	6 (3.0%)	
Abortion	4 (7.7%)	3 (1.5%)	
<b>ICU Admission (Yes)</b>	1 (1.7%)	5 (2.5%)	03
		5 (2.5%)	1.00
<b>Maternal Mortality (Yes)</b>	1 (1.7%)		03
<b>Neonatal COVID Status (Positive)</b>	0 (0.0%)	2 (1.0%)	1.00
<b>Neonatal Outcome</b>			03
Alive	41 (95.3%)	184 (95.3%)	0.82
Expired	1 (2.3%)	3 (1.6%)	
NICU	1 (2.3%)	6 (3.1%)	
<b>COVID Vaccination</b>			1.00
Not Vaccinated	59 (100.0%)		02
Vaccinated	0 (0.0%)	201 (100.0%)	0
		(0.0%)	



\*\*\*Significant at  $p < 0.05$ , 1: Wilcoxon-Mann-Whitney U Test, 2: Chi-Squared Test, 3: Fisher's Exact Test

#### IV. CONCLUSION

This chapter investigated that SARS-CoV-2 infection in pregnancy has various characteristics and its maternal and fetal outcomes are not always predictable. Also its fair association with risks of preeclampsia, stillbirth, preterm birth, oligohydramnios, gestational diabetes, IUGR is also highlighted. This chapter recommended that future studies are needed to collect more robust data for substantial validation. This enables a better understanding of the pathophysiologic pathways and associates with determining effective strategies to prevent adverse outcomes in pregnant people with COVID-19. The successful mantra to cut off the chain of transmission of this SARS-Cov2 pathogen, and its deleterious effects include implementation of preventive measures like regular hand hygiene, maintaining social distancing, following respiratory etiquettes, staying at home, and disinfecting contaminated surfaces; for all these educational materials can also be developed and distributed.

**ETHICAL APPROVAL:** It was taken from the institutional ethics committee of Goa Medical college before commencement of study

**CONFLICT OF INTEREST:** None, no external funding.

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