A Anandhi
Professor of Obstetrics and
Gynaecology, Govt. RSRM
Hospital, Govt. Stanley Medical
College, Chennai, Tamil Nadu,
India

PR Rani
Professor of Obstetrics and
Gynaecology, Govt. RSRM
Hospital, Govt. Stanley Medical
College, Chennai, Tamil Nadu,
India

Dr. R Mythra Bhavini
Assistant Professor, Govt. RSRM
Hospital, Govt. Stanley Medical
College, Chennai, Tamil Nadu,
India

K Kalaivani
Professor of Obstetrics and
Gynaecology, Govt. RSRM
Hospital, Govt. Stanley Medical
College, Chennai, Tamil Nadu,
India

Luke Ravi Chelliah
Professor of Pediatrics, Madras
Medical College, Chennai, Tamil
Nadu, India

A prospective observational study of the maternal and neonatal outcome of COVID positive deliveries in a tertiary care institution in Chennai

A Anandhi, PR Rani, Dr. R Mythra Bhavini, K Kalaivani and Luke Ravi Chelliah

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Abstract
Background: Pregnancy alters the body's immune system and response to viral infections in general, which can occasionally cause more severe symptoms. This may be the same for COVID-19 but there is currently no evidence that pregnant women are more likely to need admission to intensive care or have increased morbidity and mortality than non-pregnant adults. This study was undertaken at Govt RSRM Lying in Hospital, Royapuram, and Chennai which is a tertiary care institution and referral centre for all COVID positive antenatal patients from the surrounding Containment areas.
Aim of the study: To study the maternal and neonatal outcome of COVID positive antenatal patients admitted in GOVT RSRM Lying in Hospital.
Methodology: All patients who delivered in the COVID ward of our hospital have been observed and their maternal and neonatal outcome and recovery was documented.
Study Period: From April 2020 to July 2020
Results: 741 patients were admitted in the COVID ward of our hospital from April to July 2020. Totally 301 patients delivered during this period with 151 LSCS, 138 Labournaturale and 12 Outlet forceps deliveries. 76.4% of the patients belonged to the age group of 21 to 30 years. 57 patients were primigravida and 244 patients were multigravida patients.97.3% of the patients were asymptomatic and were detected as COVID Positive in routine antenatal screening or contact tracing.93.4% of the patients admitted in COVID ward were from the major containment areas of Chennai like Tondiarpet and Royapuram. The COVID positive patients had obstetric complications like GHTN, GDM and also other comorbidities.
Conclusion: All antenatal patients nearing delivery are now being universally screened for COVID 19 infection and isolation and contact tracing is being done. Public health measure like Social distancing, hand washing, avoiding crowded areas and wearing protective face masks will go a long way in the control of the pandemic.

Keywords: Antenatal patients, maternal outcome & neonatal outcome, COVID 19 in pregnancy

Introduction
Novel coronavirus (SARS-CoV-2) is a new strain of coronavirus causing COVID-19, first identified in Wuhan City, China towards the end of 2019.The pandemic disease COVID 19 has spread to almost 213 countries of the world by August and has a worldwide death rate of 4%.This pandemic has created a state of worldwide fear and chaos as there is no effective proven cure or vaccine at present.
Global cases of COVID-19 have evidence of human-to-human transmission. This virus can be readily isolated from respiratory droplets or secretions, peritoneal fluid, faeces and fomites. Transmission of the virus is known to occur most often through close contact with an infected person (within 2 meters) or from contaminated surfaces.
The overall rate of COVID 19 diagnosis in pregnant and recently pregnant women attending or admitted to hospital for any reason was 10% [2]. Pregnant women do not appear more likely to contract the infection than the general population. Pregnancy itself alters the body's immune system and response to viral infections in general, which can occasionally cause more severe symptoms. This may be the same for COVID-19 but there is currently no evidence that pregnant women are more likely to be severely affected, need admission to intensive care, or have increased morbidity and mortality from the illness than non-pregnant adults.
It usually presents with low grade to high grade fever, cough, breathlessness, anosmia, loss of taste and diarrhoea.

Corresponding Author:
Dr. R Mythra Bhavini
Assistant Professor, Govt. RSRM
Hospital, Govt. Stanley Medical
College, Chennai, Tamil Nadu,
India

The most common symptoms reported by pregnant women with suspected or confirmed COVID 19 were fever (40%) and cough (39%). Lymphopenia (35%) and raised CRP levels (49%) were the most common laboratory findings [2]. Some cases may progress to pneumonia, multiorgan dysfunction and cytokine storm. The duration from exposure to onset of symptoms is around two to fourteen days. It has a droplet spread during coughing, sneezing, etc. The droplets may either remain airborne or fall on the ground. They last for a varied amount of time on different surfaces.

It can be detected on or pharyngeal or nasopharyngeal swab by real time polymerase chain reaction (RT-PCR). CT may also be helpful in symptomatic patients but is not routinely recommended. Frequent washing of hands and face, maintaining social distancing, quarantine, covering face while coughing or sneezing, wearing face masks can help in preventing dissemination of the disease. The disease chiefly affects the lungs. It has been found that the virus uses angiotensin converting enzyme 2 (ACE2), most abundantly found in the alveolar cells of the lungs. The virus has a surface glycoprotein or spike protein which connects to ACE2 to enter the cell. Hence it has been postulated that decreasing ACE2 activity might be protective.

Pregnancy by itself also induces a deficiency of ACE2. Hence there is fear that the additional ACE2 deficiency induced by the virus may aggravate the damage due to the virus. Pregnancy is also a state of reduced cell mediated immunity, hence there is possibility of increased viral activity in pregnancy.

Treatment comprises antipyretics, intravenous fluid therapy, oxygen, etc. Paracetamol is recommended for control of temperature. Low molecular weight heparin has been suggested in people showing features of coagulopathy. Other drugs being studied are hydroxychloroquine, oseltamivir, remdesivir, etc. Disease rates have been found to be lesser in countries where BCG vaccination is mandatory. Severecases may require high flow nasal oxygen therapy, use of Non rebreathing masks or mechanical ventilation. With regard to vertical transmission (transmission from woman to her baby antenatally or intrapartum), evidence suggests that vertical transmission might be possible. Two reports have published evidence of immunoglobulin M (IGM) for SARS-CoV-2 in neonatal serum at birth. A recent report has demonstrated a high SARS-CoV-2 viral load in the placenta, associated with a maternal viraemia and followed by a neonatal infection, including neurological manifestations with inflammatory changes in the neonatal cerebrospinal fluid.

This study was undertaken at Govt RSRM Lying in Hospital, Royapuram, and Chennai which is a tertiary care institution and referral centre for all COVID positive antenatal patients from the surrounding Containment areas.

Aim of the study
To study the maternal and neonatal outcome of COVID positive antenatal patients admitted in Govt RSRM Lying in Hospital from April 2020 to July 2020.

Methodology
All patients who delivered in the COVID ward of our hospital have been observed and their maternal and neonatal outcome and recovery was documented. A detailed history regarding their symptoms, exposure to positive COVID patients, area of residence – Containment or Non containment area, Travel history to foreign countries, antenatal checkup and previous comorbid illnesses was obtained from the patients and

documented. The patients were followed up during their period of isolation and during the process of labour and delivery. All the babies born to COVID positive mothers were tested for COVID 19 and treated accordingly.

The following data was documented for all patients
- Age of patient
- Period of gestation
- Symptoms and severity
- Exposure to suspect or Positive patients
- Sample-nasopharyngeal/or pharyngeal
- Hospital/Lab where swab was taken
- Date of taking swab
- Date of reporting swab positive
- Abnormal blood investigations if any
- Duration of symptoms
- Number of days required for the resolving of symptoms
- Required obstetric intervention
- Mode of delivery
- Induction if required
- Indication of Caesarean section
- Obstetric complications
- Needed blood or blood products
- Needed higher antibiotics
- Any other medications-LMWH, Steroids, Ivermectin, Taculizumab
- Oxygen therapy or ventilator support
- Neonatal outcome
  All the data was documented and analysed.

Results
741 patients were admitted in the COVID ward of our hospital from April to July 2020.All the Antenatal patients getting admitted in our hospital for various reasons were also screened for COVID infection and isolated accordingly. We also had COVID positive patients who were referred from other Government and private hospitals to our institution for isolation and further obstetric care. All patients were admitted in the COVID ward and routine investigations were done. The patients were started on Tab. Hydroxychloroquine after performing an ECG and getting Cardiologist opinion. Any sick patients needing Oxygen support and critical care were managed in the specially designated COVID Intensive care unit with the help of anaesthetists and Physicians. Patients with severe symptoms and deteriorating Oxygen saturation levels were managed with High flow oxygen therapy with Non rebreathing mask. Such patients were subjected to CT chest and Chest X ray with Abdominal shield. Patients who had elevated levels of D-dimer, IL-6, Serum ferritin and CRP were treated with Low Molecular weight Heparin, steroids, Ivermectin and Inj. Toculizumab. According to a report of 8207 pregnant women with COVID 19, done by the US Centers for Disease Control and Prevention between January 22 to June 7, 2020, after adjusting for age, presence of underlying conditions and race and ethnicity, the risks of Intensive care admissions and mechanical ventilation were significantly higher among pregnant women than women who were not pregnant [1].

Totally 301 patients delivered during this period with 151 LSCS, 138Labournaturale and 12 Outlet forceps deliveries.76.4% of the patients belonged to the age group of 21 to 30 years. According to the Systematic review and Met analysis published in the British Medical Journal in September 2020, increased maternal age, high body mass index, chronic hypertension and preexisting diabetes were associated with severe COVID 19 in pregnancy [2]. 57 patients were primigravida and 244 patients were

multigravida patients. 97.3% of the patients were asymptomatic and were detected as COVID Positive in routine antenatal screening or contact tracing. 93.4% of the patients admitted in COVID ward were from the major containment areas of Chennai like Tondiarpet and Royapuram. The COVID positive patients had obstetric complications like GHTN, GDM and also other comorbidities. The associated complications were not worsened due to the COVID infection in these patients and routine antenatal management was given as that of normal Non COVID antenatal patients. Routine antenatal monitoring was done for all patients and they were discharged after a period of isolation of 10 days. Patients were managed according to their Gestational age and obstetric complications and induction of labour was done similar to that Non COVID patients. According to the meta analysis, spontaneous preterm birth rate was 6% in women with COVID 19. The odds of any preterm birth was high in pregnant women with COVID 19 compared to those without the disease

[2]. 94.4% of the babies born to COVID mothers had normal birth weight and only 10.3% of the babies needed NICU admission. According to the British Medical Journal Met analysis, 25% of the neonates born to women with COVID 19 were admitted to the Neonatal Unit [2]. All babies were screened for COVID infection by nasopharyngeal swab RT-PCR and only 4 babies were detected to be COVID positive. These 4 babies were admitted in NICU and monitored and discharged well. As reported by Dong *et al.* the possibility of vertical transmission has been elicited due to the increased IGM level in the neonate [3]. In their extensive research Valdes *et al.* reported that ACE2 receptors were detected in abundance in the materno fetal interface throughout pregnancy. This can be correlated to the possibility of SARS CoV2 utilising the ACE2 receptors present on the materno fetal interface to vertically transmit from the mother to the fetus [4].

Table 1: High risk/comorbidity

High risk/comorbidity				
		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	252	83.7	83.7	83.7
	Anemia	6	2.0	2.0	85.7
	Bronchial Asthma	3	1.0	1.0	86.7
	Chronic HTN	3	1.0	1.0	87.7
	Placenta previa	1	.3	.3	88.0
	GDM	9	3.0	3.0	91.0
	HBS AG	2	.7	.7	91.7
	Hypothyroid	13	4.3	4.3	96.0
	IUGR	1	.3	.3	96.3
	Twins	1	.3	.3	96.7
	GHTN	8	2.7	2.7	99.3
	Overt DM	2	.7	.7	100.0
	Total	301	100.0	100.0	

Table 2: Mode of delivery

Mode of delivery				
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Instrumental Delivery	12	4.0	4.0	4.0
	Elective LSCS	5	1.7	1.7	5.6
	Emergency Repeat LSCS	53	17.6	17.6	23.3
	Emergency LSCS	93	30.9	30.9	54.2
	Labour Naturale	138	45.8	45.8	100.0
	Total	301	100.0	100.0	

Table 3: Birth weight

Birth weight				
		Frequency	Percent	Valid percent	Cumulative percent
Valid	LBW(<2.5 KG)	15	5.0	5.0	5.0
	Normal(2.5 TO 4 KG)	284	94.4	94.4	99.3
	Big baby(> 4 KG)	2	.7	.7	100.0
	Total	301	100.0	100.0	

Table 4: NICU admission

NICU admission				
		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	270	89.7	89.7	89.7
	Yes	31	10.3	10.3	100.0
	Total	301	100.0	100.0	
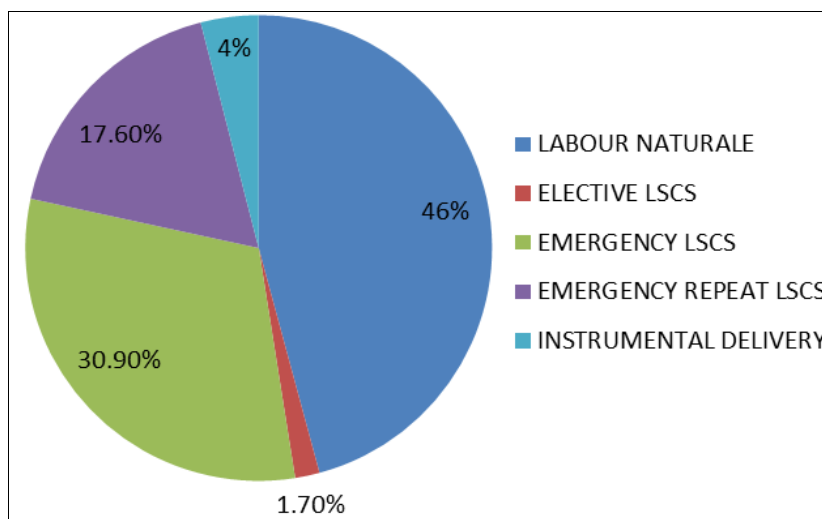
Chart 1: Mode of delivery

Table 5: *Gravida* * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
Gravida	*Gravida* 1	Count	33	24	0	57
		% of Total	11.0%	8.0%	0.0%	18.9%
	Multi	Count	0	206	38	244
		% of Total	0.0%	68.4%	12.6%	81.1%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	160.971[a]	2	.000

Table 6: Gestational age * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
Gestational age	37	Count	0	31	6	37
		% of Total	0.0%	10.3%	2.0%	12.3%
	38	Count	3	65	1	69
		% of Total	1.0%	21.6%	0.3%	22.9%
	39	Count	1	125	6	132
		% of Total	0.3%	41.5%	2.0%	43.9%
	40	Count	29	9	25	63
		% of Total	9.6%	3.0%	8.3%	20.9%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	181.303[a]	6	.000

Table 7: Symptomatic * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
symptomatic	Asymptomatic	Count	33	230	30	293
		% of Total	11.0%	76.4%	10.0%	97.3%
	Symptomatic	Count	0	0	8	8
		% of Total	0.0%	0.0%	2.7%	2.7%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	56.880ᵃ	2	.000

Table 8: Containment area * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
Containment area	No	Count	1	17	2	20
		% of Total	0.3%	5.6%	0.7%	6.6%
	Yes	Count	32	213	36	281
		% of Total	10.6%	70.8%	12.0%	93.4%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.019ᵃ	2	.601

Table 9: High risk * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
High risk	No	Count	31	193	28	252
		% of Total	10.3%	64.1%	9.3%	83.7%
	Anemia	Count	2	3	1	6
		% of Total	0.7%	1.0%	0.3%	2.0%
	Bronchial Asthma	Count	0	3	0	3
		% of Total	0.0%	1.0%	0.0%	1.0%
	Chronic HT	Count	0	2	1	3
		% of Total	0.0%	0.7%	0.3%	1.0%
	Placenta previa	Count	0	1	0	1
		% of Total	0.0%	0.3%	0.0%	0.3%
	GDM	Count	0	4	5	9
		% of Total	0.0%	1.3%	1.7%	3.0%
	HBS AG +	Count	0	1	1	2
		% of Total	0.0%	0.3%	0.3%	0.7%
	HYPOTHYROID	Count	0	13	0	13
		% of Total	0.0%	4.3%	0.0%	4.3%
	IUGR	Count	0	1	0	1
		% of Total	0.0%	0.3%	0.0%	0.3%
	Twins	Count	0	1	0	1
		% of Total	0.0%	0.3%	0.0%	0.3%
	GHTN	Count	0	7	1	8
		% of Total	0.0%	2.3%	0.3%	2.7%
	Overt	Count	0	1	1	2
		% of Total	0.0%	0.3%	0.3%	0.7%
	Total	Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	33.049ᵃ	22	.061

Table 10: Mode of delivery * age group

Crosstab						
			Age group			Total
			<=20	21-30	>30	
Mode of delivery	Instrumental	Count	1	10	1	12
		% of Total	0.3%	3.3%	0.3%	4.0%
	Elective LSCS	Count	0	3	2	5
		% of Total	0.0%	1.0%	0.7%	1.7%
	EMER RPT LSCS	Count	5	40	8	53
		% of Total	1.7%	13.3%	2.7%	17.6%
	EMER LSCS	Count	10	70	13	93
		% of Total	3.3%	23.3%	4.3%	30.9%

	LN	Count	17	107	14	138
		% of Total	5.6%	35.5%	4.7%	45.8%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.475[a]	8	.706

Table 11: Birth weight * age group

Crosstab						
			AGE GROUP			Total
			<=20	21-30	>30	
Birth weight	LBW	Count	1	13	1	15
		% of Total	0.3%	4.3%	0.3%	5.0%
	Normal	Count	32	215	37	284
		% of Total	10.6%	71.4%	12.3%	94.4%
	Big baby	Count	0	2	0	2
		% of Total	0.0%	0.7%	0.0%	0.7%
Total		Count	33	230	38	301
		% of Total	11.0%	76.4%	12.6%	100.0%

Chi-Square Tests			
	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.577[a]	4	.813

Discussion

Corona virus or COVID 19 is a type of severe acute respiratory syndrome corona virus (SARS-COV 2). It is a highly infectious disease which has spread across the world at quite an alarming rate. Treatment comprises antipyretics, intravenous fluid therapy, oxygen, etc.

The disease has been found to have a higher incidence and severity in men when compared to women worldwide. This could be due to lack of oestrogen which helps protect women against many chronic diseases. Elderly patients (≥65 years old), were more likely to develop severe form of the disease. Men tended to develop more serious illness than women. It was also found that mortality was also higher in the elderly. According to studies in China, the number of men was found to be 2.4 times that of women in the deceased patients. While men and women had similar susceptibility, men were at higher risk of dying.

Most pregnant women will experience only mild or moderate cold/flu-like symptoms. Cough, fever, shortness of breath, headache and anosmia are other relevant symptoms. More severe symptoms which suggest pneumonia and marked hypoxia are widely described with COVID-19 in older people, the immunosuppressed and those with chronic conditions such as diabetes, cancer or chronic lung disease. The symptoms of severe infection are no different in pregnant women and early identification and assessment for prompt supportive treatment is key in management.

There are currently no data suggesting an increased risk of miscarriage in relation to COVID-19. Case reports from early pregnancy studies with SARS-CoV and MERS-CoV have not demonstrated a significant relationship between infection and increased risk of miscarriage or second trimester loss. There is no evidence that fetal growth restriction (FGR) is a consequence of COVID-19; however, at present, this is considered possible as two-thirds of pregnancies with SARS were affected by FGR.

Conclusion

The course of COVID 19 disease in pregnancy and its effects on the fetus and the process of labour and delivery are still being studied worldwide in many countries. Melanie M taylor, MD *et al.* have published a review in The Lancet stating that inclusion of pregnant women in COVID 19 clinical trials would allow evaluation of effective therapies that might improve maternal health, pregnancy and birth outcomes and avoid the delay of developing treatment recommendations for pregnant women [5].Effective management of low risk antenatal patients at home without exposure to the virus in the hospital environment is the most important step in prevention of the disease. All antenatal patients nearing delivery are now being universally screened for COVID 19 infection and isolation and contact tracing is being done. Public health measure like social distancing, avoiding crowded areas, regular hand washing and wearing protective face masks will go a long way in the control of the pandemic.

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