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MATERNAL AND FETAL OUTCOME AMONG PREGNANT WOMEN WITH COVID-19 INFECTION IN A TERTIARY CARE HOSPITAL

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ABSTRACT

BACKGROUND:

The COVID-19 pandemic has presented with hurdles for healthcare providers and pregnant women, causing changes to many pregnant women's birth plans. Abrupt changes to the protocols of various hospitals were made. Many labor room and delivery policies were also made. Limited data exists on the effects of the pandemic on the maternal health care.

MATERIALS AND METHODS:

This was a prospective observational study carried out in the Department of Obstetrics and Gynaecology, Krishna Institute Of Medical Sciences, Karad, Maharashtra, India over 1 year. 200 singleton pregnancies were studied. Cases enrolled in this study were divided into two groups, the first being infected by the SARS-CoV-2 virus and the second group consisted of healthy pregnant women.

RESULTS: Most common age group affected with COVID-19 were between the age 25-29 years. Primigravidas were the most common in both groups. Lower socio-economic class were

the most affected by COVID-19. Asymptomatic patients were the highest in COVID-19 affected study group at (56%) followed by those experiencing generalized weakness (47%) and fever (42%). Pre-eclampsia syndrome was seen in 47% patients in infected group. IUGR was also noted in 14% cases of the infected group compared to healthy group. In this study, number of term deliveries were similar in both infected and healthy group. The study showed a greater incidence of cesarean section among COVID-19 positive group (62%) compared to healthy group (42%).

67% neonates weighed between 2.500kg to 3.999kg, in infected study group. COVID-19 positive study group had 3 IUFD. Only 2 of the babies were Positive for COVID 19 infection, which is not statistically significant enough to prove the evidence of Vertical transmission.

INTRODUCTION:

The novel coronavirus – CoV – is a new strain of coronavirus. The disease caused by this virus was first detected in China's Wuhan region in 2019.

The disease, previously called as 2019-nCoV, was later termed as COVID-19.

The novel coronavirus belongs to the same family of viruses like the SARS virus.

The virus is transmitted through direct contact with droplets of an infected person and touching surfaces contaminated with the virus. The virus can survive for several hours on surfaces but simple disinfectants can kill it.

Symptoms of the disease include fever, cough and shortness of breath. In severe cases, infection may cause pneumonia and breathing difficulties. It has shown to be fatal in a large number cases.

It has infected millions of people around the world causing thousands of deaths. This major public health problem affected pregnancies, as well.

It is suggested that SARS-CoV-2 infects the host cell by using a similar receptor such as angiotensin - converting enzyme 2 (ACE2).

Expression in endometrium tissue and placenta was reported too. **[1]**.

Regarding the outcome of such an expression, it can be argued that the expression of viral receptors increases vulnerability to infection theoretically. Yet, so far, pregnancy has been known not to be a condition that adversely affects the SARS-CoV-2 infection course **[2, 3]**.

In the literature, some studies have pointed the association between SARS-CoV-2 infection and preterm birth and increased maternal intensive care unit (ICU) need.

However, adverse fetal and maternal outcomes in patients infected during pregnancy are still the subject of research.

This study is aimed to evaluate the prognosis and outcome of pregnant women and neonates who were treated for SARS-CoV-2 infection.

MATERIAL AND METHODS:

This was a prospective observational study carried out in the Department of Obstetrics and Gynaecology, Krishna Institute Of Medical Sciences, Karad, Maharashtra, India over 1 year. 200 singleton pregnancies were studied.

The study included COVID-19 positive and negative pregnant women as detected by RT-PCR tests over a period of 1 year from June 2020 to June 2021.

All Pregnant women whose Nasopharyngeal swabs were tested for COVID-19 (RT-PCR) at Krishna Hospital, namely those residing in a known Containment Zone, those with history of travel from another district with known cases of COVID-19, those with history of contact with COVID-19 patient or those who willingly underwent testing for COVID-19 as a precautionary measure. Healthy pregnant women giving birth at our hospital were included in the control group.

THE MATERNAL OUTCOME WAS ASSESSED IN TERMS OF:

- Clinical signs and symptoms on admission
- Development of Maternal complications during pregnancy and after delivery
- Preterm/Term/Post-Term deliveries
- Mode of Delivery
- Intra-Uterine Growth Retardation
- Intra-Uterine Fetal Demise

THEIR NEWBORNS WERE ASSESSED IN TERMS OF:

- Maturity of baby at birth
- APGAR score at birth
- Birth Weight
- Need for NICU admission
- Perinatal Deaths including Still-birth and Neonatal death
- COVID testing of Neonates at birth- Positive or Negative

OBSERVATIONS:

Most common age group affected with COVID-19 were between the age 25-29 years followed by 20-24 years in both groups. 58% and 32% pregnant women were infected in 25-29 years and 20-24 years age group respectively. The healthy pregnant study group followed closely at 60% and 32% respectively in the above mentioned age group. ($p>0.5$) (**Table 1**).

In this study, Primigravidas were the most common in both groups at 62% and 59% in infected and healthy groups which was not statistically significant. (p>0.57) (**Table 2**).

Lower socio-economic class were the most affected by COVID-19. In infected group, it stood at 58% and in healthy group it stood at 63%. This is probably due to the housing characteristics and not occupational and/or educational variables. (p-value is >0.4) (**Table 3**).

Asymptomatic patients were the highest in COVID-19 affected study group at (56%) followed by those experiencing generalized weakness (47%) and fever (42%). Thus it can be concluded that COVID-19 infected patients experience more symptoms compared to healthy population. The finding was statistically significant at p-value 0.0248. (**Table 4**).

As for the treatment process, all hospitalized SARS-CoV-2 infected pregnant women received low molecular weight heparin therapy. Overall, 35 received hydroxychloroquine, 22 were given favipiravir, 42 did not receive any treatment. 1 patient was given both hydroxychloroquine and favipiravir treatment. O2 supplementation was required for 7 patients.

Pre-eclampsia syndrome was seen in 47% patients in infected group as opposed to 14% in healthy group. IUGR was also noted in 14% cases of the infected group compared to healthy group. Although not statistically significant (p-value is 0.1), a rise in development of pre-eclampsia syndrome and IUGR in COVID-19 infected cases is noteworthy (**Table 5**).

In this study, number of term deliveries were similar in both infected and healthy group. Although some studies have reported a greater rate of pre-term deliveries, the current study had no such observation and it was also not statistically significant. (p-value >0.4) (**Table 6**).

The study showed a greater incidence of cesarean section among COVID-19 positive group (62%) compared to healthy group (42%). Although Cesarean section is not a recommended method of delivery in COVID infection, this mode of delivery was seen in most of the cases. Most common indication for cesarean section being previous cesarean section not willing for trial of labor followed by fetal distress. This was statistically significant. (p value <0.004) (**Table 7 & 8**).

There were no incidences of PPH observed in this study. Active management of third stage of labor was done for each delivery. All deliveries of symptomatic cases were performed without delayed cord clamping and skin-toskin contact. All newborns were

isolated immediately after the delivery. .2 COVID-19 infected mothers were shifted to ICU post cesarean section. Both recovered uneventfully. . There were no maternal deaths observed during the study period.

67% neonates weighed between 2.500kg to 3.999kg, in infected and 61% in healthy study group. This also showed that there is no significance between birthweights of both groups. (p-value is >0.3). COVID-19 positive study group had 3 IUFD and COVID-19 negative group had 2 IUFD. Of 97 delivered neonates in infected group and 98 in healthy group (excluding IUFD), at p-value>0.5 there was no significance between APGAR scores at 5min in neonates of infected group compared to healthy group. 88.65% neonates delivered by COVID infected mothers had APGAR score of 7 or more compared to 85.71% in healthy mothers. Similar rates of NICU admission were seen in both groups. Both groups of the study reported 1 neonatal death each. (**Tables 9, 10, 11 & 12**).

RT-PCR testing for COVID-19 was done only for the neonates of COVID 19 Positive Pregnant women. Only 2 of the babies were Positive for COVID 19 infection, which is not statistically significant enough to prove the evidence of Vertical transmission. Both the babies were discharged after the period of quarantine without any complications. (**Table 13**).

Table 1: Age Distribution Of Study Cases

Age	COVID-19 POSITIVE CASES(n=100)	COVID-19 NEGATIVE CASES(n=100)
>18 - <20 YEARS	3(3%)	5(5%)
20-24 YEARS	32(32%)	32(32%)
25-29 YEARS	58(58%)	60(60%)
30-35 YEARS	7(7%)	3(3%)
TOTAL	100(100%)	100(100%)

The chi-square statistic is 2.1339. The p-value is .545085. The result is not significant at p < .05.

Table 2: Parity Of Study Cases

PARITY	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
PRIMIPARA	62(62%)	59(59%)
2^{ND} PARA	22(22%)	28(28%)
3^{RD} PARA OR MORE	16(16%)	13(13%)
TOTAL	100	100

The chi-square statistic is 1.1047. The p-value is .575588. The result is not significant at p < .05.

Table 3: Comparison Between Socio-Economic Status Of Study Cases

SOCIO-ECONOMIC STATUS	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
UPPER	3 (3%)	5 (5%)
UPPER MIDDLE	8 (8%)	8 (8%)
LOWER MIDDLE	11 (11%)	13 (13%)
UPPER LOWER	20 (20%)	11 (11%)
LOWER	58 (58%)	63 (63%)
TOTAL	100	100

The chi-square statistic is 3.4862. The p-value is .479983. The result is not significant at p < .05.

Table 4: Comparison Of Symptoms Between Study Cases

SYMPTOMS	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
BREATHLESSNESS	3 (3%)	0(0%)
FEVER	47 (47%)	11(11%)
GENERALISED WEAKNESS	42 (42%)	5 (5%)
COUGH	17 (17%)	11(11%)
LOSS OF TASTE AND SMELL	14(14%)	0
DIARRHEA	6(6%)	3 (3%)
CHEST PAIN	0(0%)	0(0%)
SPO2 <94%	3(3%)	0(0%)
ASYMPTOMATIC	56(56%)	86 (86%)

The chi-square statistic is 11.1622. The p-value is .0248. The result is significant at p < .05.

Table 5: Comparison Of Maternal Complications Between Study Cases

COMPLICATIONS	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
PRE-ECLAMPSIA SYNDROME	47 (47%)	14(14%)
GDM	4(4%)	6 (6%)
IUGR	14 (14%)	6 (6%)
IUFD	3 (3%)	2 (2%)
CARDIOMYOPATHY	1 (1%)	0(0%)

The chi-square statistic is 6.0423. The p-value is .196009. The result is not significant at p < .05.

Table 6: Comparison Of Gestational Age At Delivery In Studycases

GESTATIONAL AGE	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
PRETERM (<37 WEEKS)	32(32%)	36(36%)
TERM (37WEEKS-42WEEKS)	64(64%)	57(57%)
POSTTERM (>42 WEEKS)	4(4%)	7(7%)

The chi-square statistic is 1.4584. The p-value is .482286. The result is not significant at p < .05.

Table 7: Comparison Of Mode Of Delivery In Study Cases

MODE OF DELIVERY	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
CESAREAN SECTION	62(62%)	42(42%)
VAGINAL DELIVERY	38(38%)	58(58%)

The chi-square statistic is 8.0128. The p-value is .004645. The result is significant at p < .05.

Table 8: Comparison Of Indications Of Cesarean Section In Study Cases

INDICATION	COVID-19 POSITIVE CASES (n=62)	COVID-19 NEGATIVE CASES (n=42)
FETAL DISTRESS	11(17.74%)	12(28.57%)
SEVERE IUGR	3(4.83%)	2(4.76%)
SEVERE OLIGOHYDRAMNIOS	5(8.06%)	3(7.14%)
PREVIOUS LSCS	23(37.09%)	11(26.19%)
BREECH	2(3.22%)	3(7.14%)
FAILURE OF INDUCTION	6(9.677%)	4(9.52%)
SEVERE PREECLAMPSIA	8(12.90%)	5(11.90%)
MATERNAL REQUEST	4(6.45%)	2(4.76%)

The chi-square statistic is 2.2756. The p-value is .685215. The result is not significant at p < .05

Table 9: Comparison Of Birth Weights In Study Cases

BIRTH WEIGHT	COVID-19 POSITIVE CASES (n=100)	COVID-19 NEGATIVE CASES (n=100)
<2.499KG	32(32%)	35(35%)
2.5KG -3.999KG	67(67%)	61(61%)
>4.0KG	1(1%)	4(4%)

The chi-square statistic is 2.2156. The p-value is .330288. The result is not significant at p < .05.

Table 10: Comparison Of Apgar Scores At 5min In Neonates Of Study Cases

APGAR SCORE	COVID-19 POSITIVE CASES (n=97)	COVID-19 NEGATIVE CASES (n=98)
<7	11 (11.35%)	14 (14.29%)
7 OR MORE	86 (88.65%)	84 (85.71%)

The chi-square statistic is 0.3784. The p-value is .538455. The result is not significant at p < .05.

Table 11: Comparison Of Nicu Admission In Neonates Of Study Cases

NICU ADMISSION	COVID-19 POSITIVE CASES (n=97)	COVID-19 NEGATIVE CASES (n=98)
REQUIRED	7(7.21%)	6(6.12%)
NOT REQUIRED	90(92.78%)	92(93.87%)

The chi-square statistic is 0.0938. The p-value is .759431. The result is not significant at p < .05.

Table 12: Comparison Of Neonatal Complications Of Study Cases

CAUSES	COVID-19 POSITIVE CASES (n=97)	COVID-19 NEGATIVE CASES (n=98)
STILL BIRTH	0(0%)	0(0%)
NEONATAL DEATH	1(1.03%)	1(1.02%)

The above Table shows that there was 1 Perinatal Deaths among COVID Positive Pregnant women as Compared to 1 in the COVID Negative group. This however was not statistically significant.

Table 13: Comparison Of Neonatal Covid-19 Status In Study Cases

NEONATAL COVID STATUS	COVID-19 POSITIVE CASES (n=97)	COVID-19 NEGATIVE CASES (n=98)
COVID POSITIVE	2 (2.06%)	0(0%)
COVID NEGATIVE	0(0%)	0(0%)

DISCUSSION:

The SARS-CoV-2 infection has quickly become a pandemic and a major health problem in the world. During this pandemic period, pregnant women had to go through a great ordeal to go through safe delivery and motherhood.

In a cohort study including 252 SARS-CoV-2 positive and 3122 negative pregnant women, adverse pregnancy outcomes were found to be similar in both groups. It was thus concluded that SARS-CoV-2 infection in pregnancy did not lead to adverse outcomes (1) but to establish a definitive conclusion, there is a need for more research in this aspect of obstetrics.

In a study conducted by Arinkan SA, Dallı Alper EC, Topcu G, Muhcu M *et al* in 2021 were 116 pregnancies were evaluated, they concluded that there was no significant difference between groups after controlling mean age, parity, and birth weight.(2)

Several studies have reported a socio-economic gradient in SARS-CoV-2 infection,

hospitalization and death. Lower educational level, living in a rented accommodation and households with lower average income were associated with being more likely to require testing (3).

The study done by Llorca J in 2020 988 pregnant women were analyzed and it was concluded that the risk of infection by SARS-CoV-2 in pregnant women has a strong correlation with adverse housing conditions but not with the occupational sector or educational attainment of the women. This suggests that stringent measures taken to prevent household transmission should be taken up by pregnant women and their families **[4]**.

The most common patient-reported symptoms in a study done by Afshar Y were cough (34%), dyspnea (19%), and myalgias (19%). The most common clinical manifestations of covid-19 in pregnancy were fever (40%) and cough (41%) reported by John Allotey *et al* , in evaluation of 67271 pregnant women confirmed reports of SARS-CoV-2 infection **[5, 6]**.

Of 2184 pregnant women enrolled by Aris T. Papageorghiou ; 725 (33.2%) were enrolled in the COVID-19 diagnosed .Of these women, 59 of 725 (8.1%) had pre-eclampsia syndrome . Their study concluded that COVID-19 during pregnancy is strongly associated with preeclampsia, especially among nulliparous women. COVID-19 severity does not seem to be a factor in this association. Both pre-eclampsia and COVID infection may independently or superimpose each other and contribute to preterm birth, severe perinatal morbidity and mortality, and adverse maternal outcomes **[7]**.

Women with COVID-19 were more likely to have preterm birth [16.4%] ($P < .001$). Women giving birth with COVID-19, compared with women without COVID-19, had significantly higher rates of ICU admission [5.2%], respiratory intubation and mechanical ventilation [1.5%] and in-hospital mortality [0.1%] **[8]**

Caesarean section is not a recommended method of childbirth in pregnant women infected with COVID-19, however this was the mode of delivery in the majority of cases5,6 with fetal distress cited as the indication behind the clinical decision. In a symptomatic woman who is becoming exhausted or hypoxic, an individualized informed choice should be made regarding the possibility of shortening the length of the second stage of labor with elective instrumental birth **[9, 10]**.

No significant difference was observed in terms of the delivery week, birth weight, and

APGAR 1 scores between SARS-CoV-2 infected pregnant women **[2]**.

The odds of admission to the neonatal intensive care unit (4.89, 1.87 to 12.81, I2=96.2%) were higher in babies born to mothers with covid-19 versus those without covid-19. A stark difference is seen in a study done in Wuhan, China in June of 2020 by Vinayak Smith *et al* where 76.92% babies required NICU admission for additional care **[6, 11]**.

Among 5 neonatal deaths, three cases of mortality were related to prematurity **[12, 13]**, severe neonatal asphyxia **[13]** and low birthweight **[13]**. One neonatal death at 9-day old was associated with disseminated intravascular coagulopathy and multiple organ dysfunction with no potential correlation with COVID-19 infection **[15]**. Another neonate born at 35 weeks of gestation died 2 h after birth which was attributed to rapid deterioration in maternal condition, which eventually led to the death of the neonate **[14]**. Interestingly, there was no evidence of vertical transmission or positive COVID-19 test result among neonates. In one study performed by Madjunkov M, Dviri M and Librach C revealed that vertical transmission rate was 6% **[16]**.

CONCLUSION:

In conclusion, SARS-CoV-2 infection in pregnant

women during pregnancy increases the risk for adverse obstetric and neonatal outcomes. We consider pregnant women a high-risk group of patients towards apossible SARS-CoV-2 infection, especially those who present conditions such as gestational hypertension or obesity. Both conditions have demonstrated a relationship with a fatal response of the mother in the context of COVID-19 disease, provoking a deterioration in the natural course of pregnancy. It is shown to increase the risk for preeclampsia. Advanced maternal age, diabetes, hypertension, obesity, very high social vulnerability, and low socioeconomic status are risk factors of COVID-19-related mortality. Pregnant women at risk of serious complications of COVID-19 should be identified and prioritized for vaccination and early healthcare, especially in low resource settings. These findings have implications for public health policy and suggest that vaccination programs should target women either before pregnancy or early in pregnancy to ensure adequate protection when they will be most vulnerable.

RT-PCR testing for COVID-19 was done only for the neonates of COVID 19 Positive Pregnant women. Only 2 of the babies were

Positive for COVID 19 infection, which is not statistically significant enough to prove the evidence of Vertical transmission. Both the babies were discharged after the period of quarantine without any complications.

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