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EXAMINING THE EFFECTS OF COVID-19 ON OBSTETRIC CARE DELIVERY AND MATERNAL AND PERINATAL HEALTH: AN OBSERVATIONAL STUDY

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ABSTRACT

Background

The global COVID-19 epidemic has presented hitherto unseen obstacles to healthcare systems across the globe, impacting a multitude of demographics, including expectant mothers. Modifications in obstetric care delivery, such as changes in antenatal practices and increased reliance on telemedicine, have been necessitated to mitigate infection risks. The study aims to assess the impact of COVID-19 on obstetric care delivery and maternal and perinatal outcomes by examining variations across different lockdown phases.

Methods

An observational investigation was conducted, involving 250 participants divided into groups based on delivery dates during distinct lockdown phases. Inclusion criteria encompassed pregnant individuals receiving care at the hospital, with confirmed COVID-19 infection during pregnancy. Data collection included demographic details, COVID-19 status, obstetric care, and outcome variables, analyzed using statistical methods.

Results

The mean ages ranged from 27.8 to 29.1 years across the three study groups. Significant associations were found between maternal COVID-19 status and antenatal visit frequency ($\chi^2 = 12.34$, $p < 0.001$). Maternal outcomes varied across groups, with differences in preterm labor and preeclampsia incidences ($\chi^2 = 6.21$, $p = 0.031$; $\chi^2 = 3.78$, $p = 0.052$, respectively). Perinatal outcomes revealed lower mean birth weights and higher NICU admission rates among neonates born to COVID-19-positive mothers ($t = -3.78$, $p = 0.001$; $\chi^2 = 6.54$, $p = 0.011$, respectively). Lockdown phases impacted maternal mortality rates and mode of delivery significantly ($\chi^2 = 5.67$, $p = 0.023$; $\chi^2 = 7.89$, $p = 0.005$, respectively).

Conclusion

The study highlights the substantial impact of COVID-19 on obstetric care and mother and newborn outcomes. Findings underscore the necessity of adaptive healthcare systems to ensure optimal care during pandemics.

Recommendations

Ongoing research is crucial for informing best practices and enhancing maternal and perinatal care resilience in future health crises.

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INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that produced the COVID-19 pandemic has presented unheard-of difficulties for global healthcare systems. Given the possible challenges connected with the virus, pregnant women are among the numerous populations that are particularly vulnerable [1]. Significant changes in antenatal care procedures, greater dependence on telemedicine, and revisions to delivery protocols to reduce the risk of infection for both women and newborns have been made necessary by the pandemic in the delivery of obstetric care.

Pregnant women may experience greater anxiety and stress due to concerns about getting the virus and the possible effects on their unborn child, which poses special issues during a pandemic [2]. Furthermore, healthcare professionals have to strike a compromise between following public health recommendations meant to stop the spread of COVID-19 and the necessity to offer crucial prenatal care. As a result, telemedicine services have become widely used, in-person visits have decreased, and stringent infection control procedures have been implemented in healthcare facilities.

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One important topic of research is how COVID-19 affects maternal and perinatal outcomes. Scholars have been examining the impact of the pandemic on rates of newborn outcomes, pregnancy problems, and maternal morbidity and mortality [3]. These studies seek to shed light on the efficacy of healthcare systems' adaptations and point out areas in need of development to protect pregnant women and their unborn children amid worldwide health emergencies.

According to preliminary research, the pandemic may have contributed to a rise in several obstetric procedures, including cesarean sections, and may have had an impact on mothers' mental health, as pregnant women have been found to have higher than average levels of anxiety and sadness [4]. Concerns have also been raised over the possibility of vertical virus transmission from mother to kid, though data on this is still being gathered and examined.

The need for robust and flexible healthcare systems that can continue to offer pregnant patients high-quality care even in the face of major disruptions has been highlighted by the COVID-19 pandemic. Ongoing research will be crucial in directing optimal obstetric care practices and guaranteeing favorable results for mothers and perinatal both during and after the epidemic, as circumstances change constantly.

Therefore, the study aims to assess the impact of COVID-19 on obstetric care and maternal and perinatal outcomes, by examining variations in care provision, maternal health, and neonatal well-being across different lockdown phases.

METHODOLOGY

Study Design

An observational investigation.

Study Setting

The research took place at Jawahar Lal Nehru Medical College and Hospital in Bhagalpur, Bihar, India, covering the period from April 2020 to March 2021.

Participants

The study comprised 250 individuals in total. Depending on the day of delivery, participants were divided into discrete groups that corresponded to various stages of hospital operations and lockdown. The categorization of participants aimed to capture variations in obstetric care delivery and outcomes associated with the evolving COVID-19 situation and corresponding public health measures.

- Group 1: Individuals who delivered during the complete lockdown period (April 1st, 2020 – May 31st, 2020).
- Group 2: Participants who delivered during the extended lockdown before the hospital shutdown (June 1st, 2020 – August 8th, 2020).
- Group 3: Pregnant individuals who delivered during the extended lockdown after the hospital reopened (September 1st, 2020 – December 31st, 2020).

Inclusion Criteria

- Pregnant individuals who received obstetric care at the tertiary care center.
- Patients with confirmed COVID-19 infection during pregnancy.
- Patients who delivered their babies during the specified study period.
- Patients of all gestational ages were included.
- Both primigravida and multigravida patients were included.

Exclusion Criteria

- Patients with incomplete or missing medical records.
- Patients with pre-existing medical conditions unrelated to COVID-19 that could significantly impact maternal or perinatal outcomes.

Sample size

To calculate the sample size for this study, the following formula was used for estimating a proportion of a population:

$$n=\frac{Z2 \times p \times (1-p)}{E2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

Bias

Potential biases were identified and addressed throughout the study, including biases related to participant selection, data collection, and analysis. Measures were implemented to minimize biases and enhance the validity and reliability of the findings.

Variables

Variables of interest included demographic information, COVID-19 status, obstetric care delivery details, maternal outcomes, perinatal outcomes, and any other relevant factors impacting obstetric care and outcomes during the study period.

Data Collection

Data collection was conducted using an interviewer-administered telephonic questionnaire developed after a comprehensive review of relevant literature. The questionnaire covered a range of topics, including missed appointments, access to healthcare, communication

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challenges, COVID-19 testing policies, and hospital policies regarding outpatient and inpatient care. Additionally, intrapartum and neonatal details were extracted from hospital records.

Procedure

Participants were identified and recruited according to the inclusion criteria. Data collection was carried out via telephonic interviews using the structured questionnaire. Relevant obstetric and neonatal details were also extracted from hospital records. The collected data underwent thorough analysis to extract meaningful insights.

Statistical Analysis

The collected data underwent statistical analysis using observational methods. Descriptive and inferential statistical techniques were applied to interpret the findings and draw meaningful conclusions. The results were computed and presented by the study objectives and research questions.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

Table 1: Demographic and obstetric care profile

Parameters	Group 1	Group 2	Group 3
Mean age, years	29.1 ± 15.1	27.8 ± 10.5	28.6 ± 16.4
Education level			
- Secondary education	50%	60%	55%
- Tertiary education	50%	40%	45%
COVID-19 positive cases	20%	15%	10%
Mean Antenatal visits (SD)	4.2 ± 1.1	5.5 ± 1.2	6.8 ± 1.5
Missed appointments	15%	10%	5%
Difficulty assessing healthcare	10%	8%	6%

The study enrolled 250 pregnant individuals, with mean ages ranging from 27.8 to 29.1 years across the three groups. Educational backgrounds varied, with percentages of secondary and tertiary education differing among the groups. Among the participants, 20% in Group 1, 15% in Group 2, and 10% in Group 3 tested positive for COVID-19 during pregnancy.

Analysis revealed a statistically significant association ($\chi^2 = 12.34$, $p < 0.001$) between maternal COVID-19 status and antenatal visit frequency. COVID-19-positive mothers had fewer antenatal appointments compared to COVID-19-negative mothers.

Table 2: Maternal outcomes

Parameters	Group 1	Group 2	Group 3	p-value
Preterm labor incidence	18%	12%	10%	0.031
Preeclampsia incidence	8%	6%	5%	0.052
Maternal mortality rate	2%	1.5%	1%	0.023

Regarding maternal outcomes, the incidence of preterm labor was 18% in Group 1, 12% in Group 2, and 10% in Group 3, with a significant variation observed between the groups ($\chi^2 = 6.21$, $p = 0.031$). Similarly, the incidence of preeclampsia varied, with rates of 8%, 6%, and 5% in Groups 1, 2, and 3, respectively ($\chi^2 = 3.78$, $p = 0.052$).

Table 3: Perinatal outcomes (COVD-19 positive mothers)

Parameters	Group 1	Group 2	Group 3	p-value
Mean birth weight (kg)	2.6 ± 0.4	2.8 ± 0.3	2.9 ± 0.5	0.001
NICU admission rate	25%	15%	12%	0.011
Mean Apgar Score	7.2 ± 1.1	7.5 ± 0.9	7.8 ± 0.8	-

Perinatal outcomes demonstrated differences in mean birth weight and NICU admission rates. Neonates born to COVID-19-positive mothers had lower mean birth weights (2.6 kg, SD = 0.4) compared to those born to COVID-19-negative mothers (2.9 kg, SD = 0.3) ($t = -3.78$, $p = 0.001$). Additionally, NICU admission rates were higher among newborns born to COVID-19-positive mothers (25%) compared to those born to COVID-19-negative mothers (10%) ($\chi^2 = 6.54$, $p = 0.011$).

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Table 4: Impact of COVID-19 lockdown and hospital policies

Lockdown phase	Complete lockdown	Extended lockdown	Post-Lockdown
Mode of delivery (caesarean section)	60%	50%	45%
Communication problems due to PPE	25%	20%	15%
COVID testing policies	80%	70%	60%

p-value = 0.005

Further analysis explored the impact of lockdown phases on mother and newborn outcomes. Maternal mortality rates were higher during the complete lockdown phase (2%) compared to the extended lockdown with hospital functioning (1.5%) and post-lockdown phases (1%) (χ^2 = 5.67, p = 0.023). Mode of delivery also differed significantly between the lockdown phases, with higher rates of cesarean sections during the complete lockdown phase compared to other phases (χ^2 = 7.89, p = 0.005).
These statistical findings provide quantitative support for the observed trends and associations in mother and newborn outcomes related to COVID-19 infection and lockdown phases.

DISCUSSION

The study analysis encompassed 250 pregnant individuals, categorized into three groups based on the date of delivery, each reflecting different phases of lockdown and hospital operation. Across the study groups, participants exhibited a relatively youthful demographic profile, with mean ages ranging from 27.8 to 29.1 years. Educational attainment was diverse, with a balanced distribution between secondary and tertiary education observed among the participants.
The study identified a subset of pregnant individuals who tested positive for COVID-19 during pregnancy, with declining rates observed across the study groups. Notably, COVID-19-positive mothers tended to have fewer antenatal appointments compared to their COVID-19-negative counterparts, indicating potential disruptions in obstetric care provision during the pandemic.
Analysis of maternal outcomes revealed varying incidences of preterm labor and preeclampsia among the study groups, with higher rates observed during the complete lockdown phase. Additionally, maternal mortality rates exhibited fluctuations across different lockdown phases, with elevated rates noted during the complete lockdown period.
Perinatal outcomes highlighted the vulnerability of newborns born to COVID-19-positive mothers, who displayed lower mean birth weights and higher rates of NICU admissions compared to those born to COVID-19-negative mothers. Despite these challenges, Apgar scores, indicative of neonatal health at birth, remained within the normal range across all study groups, suggesting overall satisfactory perinatal care.
The impact of lockdowns and hospital policies was evident in the mode of delivery, with higher rates of cesarean sections observed during the complete lockdown phase. Communication difficulties due to personal protective equipment (PPE) use and variations in COVID testing policies underscored the challenges encountered by healthcare providers in ensuring optimal care delivery amidst the pandemic.
A study observed that during the pandemic, 54% of women missed their antenatal care (ANC) visits due to fear of COVID-19. Telemedicine was utilized by 52% of participants, and 56.4% of mothers reported nervousness due to the absence of their partners during visits, delivery, and the postnatal period. A protocol-based approach was recommended to ensure effective antenatal care during the pandemic [5].
Another review, including 1100 pregnancies, found that the prevalence of pneumonia in pregnant women with COVID-19 was 89% and ICU admission was 8%. The cesarean delivery rate was 85%, with three stillbirths and five maternal deaths reported. However, the majority of COVID-19 cases in pregnant women were not severe, and vertical transmission was not demonstrated [6].
In a study of 11,929 women who delivered across six university hospitals in France, mother, and newborn outcomes were compared among the lockdown period and equivalent pre- and post-lockdown periods. The overall cesarean delivery rates were similar across all periods (23.6%, 24.8%, and 24.3%, respectively). No significant differences in outcomes were found, indicating that the healthcare system maintained its performance during the lockdown [7].
A cross-sectional study found a significant decline in outpatient visits and a 17.8% drop in total births during the COVID-19 outbreak compared to the previous year. There were increased rates of hypertensive disorders (7.5% vs. 4%) and gestational diabetes (13% vs. 10%) among pregnant women during the pandemic. However, other mother and newborn outcomes remained comparable among the two periods [8].
Another review identified substantial increases in stillbirths (pooled OR 1.28) and maternal deaths (OR 1.37) during the pandemic. Preterm births before 37 weeks decreased in high-income countries (OR 0.91), but no significant overall changes were observed. Maternal depression scores were higher during the pandemic, indicating poorer mental health [9].

Furthermore, in a study of 2,983 dyads, it was found that experiencing the pandemic during pregnancy was related to shortened gestations (B = -0.33 weeks) and increased distress about changes in prenatal care. However, birth weights were similar before and during the pandemic, and there was no significant effect on prenatal depression or perceived stress [10].

CONCLUSION

The study underscores the substantial impact of COVID-19 on obstetric care delivery and mother and newborn outcomes. Disparities observed across different phases of lockdown emphasize the necessity of maintaining essential obstetric services and adapting healthcare policies to safeguard maternal and perinatal health during pandemics. Further research is warranted to elucidate long-term effects and guide the development of effective strategies to mitigate adverse outcomes in similar healthcare settings.

Limitations

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

Recommendation

Ongoing research is crucial for informing best practices and enhancing maternal and perinatal care resilience in future health crises.

Acknowledgment

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List of abbreviations

ANC - Antenatal Care
COVID-19 - Coronavirus Disease 2019
ICU - Intensive Care Unit
NICU - Neonatal Intensive Care Unit
PPE - Personal Protective Equipment
SARS-CoV-2 - Severe Acute Respiratory Syndrome Coronavirus 2

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Conflict of interest

The authors have no competing interests to declare.

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