

ORIGINAL RESEARCH ARTICLE

COVID-19 and perinatal outcomes among pregnant women admitted to isolation unit at Suez Canal university hospital, Egypt: A cross-sectional study

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Abstract

This study described the maternal and perinatal outcomes of pregnant women infected with COVID-19. A cross-sectional descriptive design was used in this study of 75 women diagnosed with COVID-19 in the isolation unit of Obstetrics and Gynecology Department at Suez Canal University hospital. Data was collected by a structured interview questionnaire and assessment of patients' records in the period from April 26, 2021, to October 31, 2021. This study found that 7/29 (24.14%) of women had abortions, 9/46 (19.57%) had preterm labor, 2/19 (10.53%) had both postpartum hemorrhage and puerperal pyrexia, 2/46 (4.35%) had an antepartum hemorrhage, and 2/52 (3.85%) had preeclampsia. Regarding fetal complications, 2/46 (4.35%) had intrauterine fetal distress, and 2/52 (3.85%) had a stillbirth. Concerning neonatal outcomes, 31.25% of cases needed NICU admission, 12.5% required mechanical ventilation and developed ARDS, 18.75% had low birth weight, and only 6.25% of all cases died. This study concluded that pregnant women with COVID-19 seem to have a high risk of abortion and preterm birth. Their neonates are at high risk of NICU admission and low birth weight. (*Afr J Reprod Health 2022; 26[3]: 96-103*).

Keywords: Covid-19, maternal and neonatal outcomes, pregnancy

Résumé

Cette étude a décrit les résultats maternels et périnataux des femmes enceintes infectées par le COVID-19. Une conception descriptive transversale a été utilisée dans cette étude de 75 femmes diagnostiquées avec COVID-19 dans l'unité d'isolement du département d'obstétrique et de gynécologie de l'hôpital universitaire du canal de Suez. Les données ont été recueillies par un questionnaire d'entretien structuré et l'évaluation des dossiers des patients au cours de la période du 26 avril 2021 au 31 octobre 2021. Cette étude a révélé que 7/29 (24,14 %) des femmes ont eu des avortements, 9/46 (19,57 %) ont eu un accouchement prématuré, 2/19 (10,53 %) ont eu à la fois une hémorragie post-partum et une pyrexie puerpérale, 2/46 (4,35 %) ont eu une hémorragie antepartum et 2/52 (3,85 %) avaient une prééclampsie. En ce qui concerne les complications fœtales, 2/46 (4,35%) avaient une souffrance fœtale intra-utérine et 2/52 (3,85%) avaient une mortinaissance. Concernant les issues néonatales, 31,25 % des cas ont nécessité une admission à l'USIN, 12,5 % ont nécessité une ventilation mécanique et ont développé un SDRA, 18,75 % avaient un faible poids à la naissance et seulement 6,25 % de tous les cas sont décédés. Cette étude a conclu que les femmes enceintes atteintes de COVID-19 semblent avoir un risque élevé d'avortement et d'accouchement prématuré. Leurs nouveau-nés courent un risque élevé d'admission à l'USIN et de faible poids à la naissance. (*Afr J Reprod Health 2022; 26[3]: 96-103*).

Mots-clés: Covid-19, issues maternelles et néonatales, grossesse

Introduction

Coronavirus 2019 (COVID-19), which was initially discovered in Wuhan, China, in late 2019, has rapidly spread worldwide, infecting tens of millions of people¹. COVID-19 is an emerging

disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since its discovery, the number of cases and deaths has risen rapidly, with over 4,000,000 cases and at least 250,000 deaths reported worldwide as of May 2020².

Pregnant women are a particularly vulnerable category. Physiological changes in the immune, cardiovascular, and respiratory systems, particularly during the third trimester, may exacerbate the severity of respiratory disorders. Although evidence on the effects of other coronaviruses, such as those that cause SARS and Middle Eastern respiratory syndrome, is limited, it appears that coronavirus infection during pregnancy is linked to poor perinatal outcomes, including high rates of maternal and perinatal mortality, cesarean section, and preterm birth. No evidence of vertical transmission has been found. Most articles described the clinical characteristics of pregnant women with COVID-19³.

Several studies have been conducted assessing outcomes of COVID-19 in pregnant women and their newborns. Preterm birth affected more women than projected, based on historical and current national data from the UK and US registries of SARS-CoV-2-infected pregnancies. The proportions of pregnancies impacted by stillbirth, SGA infant, or early neonatal death were comparable. Although maternal death was unusual, it was greater than expected based on UK and US population statistics, which is likely due to the underreporting of women with milder or asymptomatic infection during pregnancy⁴.

Nurses have critical roles and responsibilities during the COVID-19 pandemic; they will continue to be at the front line of hospital patient care and actively involved with evaluation and monitoring in the community. Nurses have to ensure that all patients acquire personalized, high-quality services irrespective of their infectious condition; they will also engage in planning for anticipated COVID-19-related outbreaks, which increase the demand for nursing and healthcare services that might overload systems. Moreover, nurses must maintain effective supply and usage of sanitation materials and personal protective equipment and offer screening information, confinement guidelines, and triage protocols based on the latest guidance. A global pandemic needs strong nursing staff engagement in clinical management, awareness and knowledge exchange, and public safety⁵.

The impact of COVID-19 in pregnant women and their neonates is an area of research interest nowadays. To date, there is limited knowledge about SARS-CoV, maternal and perinatal outcomes of pregnant women at term in

the middle- and low-income countries⁶. Furthermore, there are specific aspects of COVID-19 and gestation that health care professionals should be aware of to diagnose the condition appropriately, assess the severity, differentiate unique COVID-19 indicators from those of obstetric difficulties, and make the best therapy decisions. As a result, this study aimed to describe perinatal outcomes among pregnant women diagnosed with COVID-19 at Suez Canal University in Ismailia, Egypt.

Objectives

This study aims to describe the maternal and perinatal outcomes of pregnant women infected with COVID-19.

Methods

Study design

A cross-sectional descriptive study design was used.

Setting

The study was conducted in the Isolation Unit of Obstetrics and Gynecology Department at Suez Canal University hospital, Ismailia, Egypt.

Target population

The target population was pregnant women with PCR confirmed with SARS-CoV-2 infection.

Study sample technique

A convenience sampling of all pregnant women diagnosed with SARS-CoV-2 infection was taken. A pregnant woman hospitalized in the Suez Canal University Hospital's isolation unit was gathered. The data collection period began on April 26, 2021, and ended on October 31, 2021.

Sample size calculations

The sample size was calculated using Epi info based on a systematic review and meta-analysis, which was performed to investigate the effect of COVID-19 on the outcomes of infected pregnant women⁷. The study reported that the pooled prevalence of neonatal mortality and stillbirth in women with COVID-19 was 4% (95% CI: 1–9%)

and 2% (95% CI: 1 – 6%), respectively. After adding a non-response rate of 10%, the sample was estimated to be 66, but there were 75 confirmed pregnant cases in the study. Based on these findings, a sample size of 60 patients was needed with a power of 90 % ($\beta=0.10$), a precision of 5%, level of significance=95% ($\alpha=0.05$)^{8,9}.

Eligibility criteria

All pregnant women admitted with Polymerase Chain Reaction (PCR) test positive for Covid-19 were included in the present study.

Tools for data collection

Tool (1): A structured interview questionnaire:

It was used to collect the information from the pregnant women, and it consists of 3 parts:

Part (1): Sociodemographic data as age, and education level.

Part (2): Obstetrical history includes questions about weeks of gestation, number of gravida and parity, number of abortions, type of previous delivery, history of current pregnancy as gestational age and complication).

Part (3): includes medical history such as (Hypertension, Diabetes mellitus, Cardiac disease ...etc.).

The researchers practiced all infection control precautions while dealing with infected pregnant women.

Tool (2): Assessment of patients' records:

We obtained the following data by reviewing the records of pregnant women. It contains questions to assess:

1. Clinical presentation and symptoms during pregnancy include fever, Cough, Rhinorrhea /sore throat, Myalgia, Fatigue, Headache, Shortness of breath, and vomiting/diarrhea.
2. Medical complications include severe pneumonia, acute respiratory distress syndrome, acute hepatic failure, acute renal failure, Cardiomyopathy, Septic shock, Intensive care unit admission, and maternal mortality.
3. Treatment modalities include oxygen support, Antivirals, Antibiotics, corticosteroids, Hydroxychloroquine, Mechanical ventilation, Immune gamma globulin, and Extracorporeal

Membrane Oxygenation, which collected from files of the patient.

4. Delivery outcomes include preterm labor, caesarian section, or normal vaginal delivery.
5. Neonatal outcomes include Apgar score, Low birth weight, neonatal intensive care unit (NICU) admission for treatment, Acute Respiratory Distress Syndrome (ARDS), Mechanical ventilation, asphyxia, and pneumonia.

The researchers collected information about investigation and treatment from files of pregnant women who were diagnosed with COVID19. If the woman presented at any trimester of pregnancy, the researchers assessed medical complications, maternal and perinatal outcomes during pregnancy, such as pregnancy complications in women and fetuses during the period of hospitalization. If the pregnant woman continued to be infected until birth in the hospital, the researchers assessed perinatal and neonatal outcomes during labor such as (delivery characteristic medical complications during labor and neonatal outcomes during delivery by using the Apgar score tool).

Tool validity and reliability

The tool was tested for its validity by a jury of five experts in obstetrics, gynecological, and medical-surgical nursing and medicine fields. In addition, the tool was tested for its reliability using test-retest reliability and proved intensely reliable.

Statistical analysis

Data were collected and entered into the computer using Statistical Package for Social Science (SPSS) program for statistical analysis (version 21)¹⁰. Quantitative data such as age and Apgar score were presented in mean and standard deviation. Qualitative data such as complications and type of treatment were presented in frequency and percentages. A Chi-square test was used to describe and compare the differences between perinatal outcomes among women with different gestational ages.

Results

In the present study, women's mean duration of hospitalization was 12.17±6.57 days. Women's age ranged from 19 to 43 years with a mean of

Table 1: Demographic data and obstetric history of the studied group

Variable	n (Total =75)	(%) (100.00)
Age		
- 20-≤30	43	(57.33)
- 31-≤40	28	(37.33)
- 41-≤50	4	(5.33)
- Min-Max	19.00 – 43.00	
- Mean ± SD.	29.11±5.77	
Educational level:		
- Illiterate	1	(1.33)
- Read and write	5	(6.67)
- Primary	42	(56.00)
- Preparatory	26	(34.67)
- Secondary	1	(1.33)
Gravidity		
- Primigravida	27	(36.00)
- Multigravida	48	(64.00)
Parity		
- Nullipara	30	(40.00)
- Multipara	45	(60.00)
Number of living children		
- ≤ 2	65	(86.67)
- >2	10	(13.33)
Abortion		
- ≤ 2	74	(98.67)
- >2	1	(1.33)
Gestational age:		
- First trimester (from week 1 to the end of week 12).	11	14.67
- Second trimester (from week 13 to the end of week 26).	24	32
- Third trimester (from week 27 to the end of the pregnancy)	40	53.33
Mean body mass index:		
- 18.5-24.9 (normal weight)	4	(5.33)
- 25-29.9 (pre-obesity)	47	(62.67)
- 30-34.9 (obesity class I)	18	(24.00)
- 35-39.9 (obesity class I)	6	(8.00)
- Min-Max	21.48 – 36.98	
- Mean ± SD.	28.97±3.24	
Contact with an infected person	25	(33.34)
Exposure to relevant environment	27	(36.00)
Duration of hospitalization (days)		
- Min-max	3-30	
- Mean ± SD.	12.17±6.57	

29.11±5.77 years. 42 (56%) of women were got primary education, 26 (34.67%) were preparatory, 5 (6.67) were read and write. 48 (64.00%) of women were multigravida, 45 (60.00%) were multipara. 74 (98.67%) of women had one or two times abortions, and only 1 (1.33%) had three times abortions. Nearly 19/75 (25.33%) of the included women were delivered during the period of hospitalization, 17/19 (89.47%) delivered by Cesarean section, and 2 (10.53%) delivered vaginally. About 18 (24.0%) women were class I

Table 2: Clinical presentation of the studied women with COVID-19 infection

Clinical presentation	n (Total=75)	(100%)
Fever at admission	73	(96.00)
Cough	69	(92.00)
Dyspnea	62	(82.67)
Fatigue	60	(80.00)
Myalgia	55	(73.33)
Sore throat	55	(73.33)
Tachypnea	51	(68.00)
Tachycardia	42	(56.00)
Headache	40	(53.33)
Chest pain	36	(48.00)
Malaise	24	(32.00)
Diarrhea	20	(26.67)
Intra-partum fever	8	(10.67)
Post-partum fever	6	(8.00)
Nasal congestion	17	(22.67)

obesity, and 6 (8.00%) were class II obesity. 25/75 (33.34%) of women had contact with an infected person. 27/75 (36.00%) women were exposed to the relevant environment (Table 1). Most of women have symptoms at presentation. The most common symptoms were fever at admission 73 (93.00%), cough 69 (92.00%), dyspnea 62 (82.67%), and fatigue 60 (80.00%). (Table 2). Regarding maternal complications, 4 (16.67%) women in the second trimester of pregnancy and 5 (12.50%) in the third trimester developed acute respiratory distress syndrome. Maternal death was reported in 1 (4.17%) in the second trimester and 2 (5.00%) in the third trimester of pregnancy. (Table 3). In the present study, 57 (76%) of the women had symptomatic treatment as shown in following table (Table 4). Obstetrical, fetal complications and neonatal outcomes were presented in Table 5

Discussion

The impact of the COVID-19 pandemic on perinatal health remains unclear. Therefore, the present study aimed to describe the adverse maternal and neonatal outcomes of pregnant women diagnosed with COVID-19. The current finding shows that COVID-19 was highest for women under 30 years of age, multigravida, and overweight body mass index. This results in the same line as Ames¹¹. Besides that, the study revealed that no case was asymptomatic at the time of admission, which is quite similar to another study that reported that about 88% of cases were symptomatic¹². In contrast, a previous study found most women asymptomatic and afebrile at presentation¹³.

Table 3: Medical complications caused by COVID-19 infection during each trimester of pregnancy

Medical complications	Trimester			Total (n=75)	Test of significance
	First (n=11) (14.67%)	Second (n=24) (32.00%)	Third (n=40) (53.33%)		
Severe pneumonia	0 0.00	1 4.17	0 0.00	1 (1.33)	$\chi^2=2.154$ $p_{(MC)}=0.466$ NS
Acute respiratory distress syndrome	0 0.00	4 16.67	5 12.50	9 (12.00)	$\chi^2=2.004$ $p_{(MC)}=0.437$ NS
Acute hepatic failure	1 9.09	1 4.17	0 0.00	2 (2.66)	$\chi^2=3.053$ $p_{(MC)}=0.227$ NS
Cardiomyopathy	0 0.00	1 4.17	0 0.00	1 (1.33)	$\chi^2=2.154$ $p_{(MC)}=0.466$ NS
Septic shock	0 0.00	1 4.17	0 0.00	1 (1.33)	$\chi^2=2.154$ $p_{(MC)}=0.466$ NS
Intensive care unit admission	0 0.00	6 25.00	3 7.50	9 (12.00)	$\chi^2=6.108$ $p_{(MC)}=0.046^*$
Maternal mortality	0 0.00	1 4.17	2 5.00	3 (4.00)	$\chi^2=0.564$ $p_{(MC)}=1.000$ NS

Table 4: Medical treatment presented for the studied women with COVID-19 infection

Treatment	Trimester			Total 75 (100.00%) n (%)	Test of significance
	First 11 (14.67%) n (%)	Second 24 (32.00%) n (%)	Third 40 (53.33%) n (%)		
Symptomatic treatment	9 81.82	20 83.33	28 70	57(76)	$\chi^2=1.701$ $p_{(MC)}=0.467$ NS
Oxygen support	6 54.55	18 75.00	31 77.50	55(73.33)	$\chi^2=2.375$ $p_{(MC)}=0.305$ NS
Antivirals	3 27.27	16 66.67	17 42.50	36(48)	$\chi^2=5.729$ $p_{(MC)}=0.059$ NS
Antibiotics	6 54.55	19 79.17	33 82.50	58(77.33)	$\chi^2=3.914$ $p_{(MC)}=0.176$ NS
Anticoagulant	6 54.55	18 75.00	28 70.00	52(69.33)	$\chi^2=1.502$ $p_{(MC)}=0.483$ NS
Corticosteroids	4 36.36	16 66.67	17 42.50	37(49.33)	$\chi^2=4.372$ $p_{(MC)}=0.114$ NS
Mechanical ventilation	0	3 12.50	0	3(12.50)	$\chi^2=6.641$ $p_{(MC)}=0.087$ NS

Table 5: Associated obstetrical, fetal complications and neonatal outcome and Apgar score for the studied women with Covid 19 infection

	N	%
Obstetrics complications		
Abortion (before 24 th gestational week)	7/29	24.14
Preeclampsia	2/52	3.85
Antepartum hemorrhage	2/46	4.35
Premature rupture of membrane (after 24 th gestational week)	1/46	2.17
Premature labor (after 24 th gestational week)	9/46	19.57
Postpartum hemorrhage	2/19	10.53
Puerperal pyrexia	2/19	10.53
Fetal complications		
Intrauterine fetal distress (after 24 th gestational week)	2/46	4.35
Stillbirth (after 20 th gestational week)	2/52	3.85

Neonatal outcome	Total 16 (100.00%)	
	n	(%)
Low birth weight	3	(18.75)
NICU admission for treatment	5	(31.25)
Respiratory distress syndrome	2	(12.5)
Mechanical ventilation	2	(12.5)
Neonatal death	1	(6.25)
Apgar score		
Apgar score 1 min		
n	16	
Min-Max	5.00 – 10.00	
Mean \pm SD.	8.93 \pm 1.913	
Apgar score 5 min		
n	16	
Min-Max	6.00 – 10.00	
Mean \pm SD.	9.06 \pm 1.691	

This difference may be because the current study was conducted only for hospitalized women.

Furthermore, most preliminary studies reported the presence of symptoms¹⁴. The most common presentations of Covid 19 confirmed pregnant cases were fever, cough, dyspnea, and fatigue. These results were in line with previous studies^{15,16}. Similarly, a systematic review revealed that the most common symptoms among pregnant cases diagnosed with Covid 19 were fever and cough¹⁷.

During COVID-19 infection, host factors stimulate the immune responses to the SARS-CoV-2 virus. Meanwhile, it has to be considered that immunopathogenesis is correlated with an out-of-control immune response as the virus propagates and migrates down the respiratory tract along the conducting airways, and a more robust innate immune response is triggered¹⁸.

Pregnant women might be at an increased risk of maternal complications from COVID-19 compared with non-pregnant women. Preexisting comorbidities, high maternal age, and high body mass index seemed to be risk factors for severe COVID-19. Our results revealed that 12% of all women developed acute respiratory distress syndrome and were admitted to ICU. Most of the women were in the second trimester of pregnancy (16.67% for respiratory distress syndrome and 25.00% for the ICU admission). Maternal death was reported in 4 % of all women. This may be explained by Physiological changes which occur during pregnancy, reducing the mother's resistance to infection¹⁹. In addition, Vasodilatation and changes in pulmonary volume can induce mucosal edema and increased upper-airway secretions. Furthermore, changes in cell-mediated immune capacity during pregnancy may result in higher maternal and fetal morbidity and mortality²⁰.

The management of covid 19 during pregnancy in our study was symptomatic treatment for women in the first and second trimesters. However, the management of the third trimester pregnant women depended on antibiotics and oxygen support. About half of Covid 19 positive cases received antiviral treatment, and no one used hydroxychloroquine. These findings were consistent with a systematic review and meta-analysis except for hydroxychloroquine because this drug was not available in the national protocol for treating Covid19 confirmed women in Egypt. They reported that the most frequently used

treatment for Covid 19 confirmed women were hydroxychloroquine, oxygen therapy, and ribavirin. The scientific evidence in managing this vulnerable population remains unclear²¹. There is a scarcity of evidence demonstrating pharmacological management and maternal and perinatal outcomes during COVID-19.

Concerning obstetrical complications with Covid 19 during pregnancy, 7/29 (24.14%) of women had abortions, 2/52 (3.85%) had preeclampsia, 2/46 (4.35%) had an antepartum hemorrhage, 1/46 (2.17%) had premature rupture of membrane, 9/46 (19.57%) had preterm labor, 2/19 (10.53 %) had a postpartum hemorrhage, 2/19 (10.53%) puerperal pyrexia. Regarding fetal complications, 2/46 (4.35%) had intrauterine fetal distress, and 2/52 (3.85%) had a stillbirth. About 19/75 (25.33%) of the included women were delivered during the period of hospitalization, 17/19 (89.47%) delivered by Cesarean section, and 2 (10.53%) delivered vaginally.

This matched with Ayed *et al.* revealed preterm births and cesarean delivery in 26.6 % and 47.8 % of the neonates from SARS-CoV-2 positive pregnant women, respectively¹². Another similar study clarified that among SARS-CoV-2 positive pregnant women, 27% of the neonates had preterm births, and 59% had cesarean births²². A systematic review comprising 33 studies revealed a preterm birth rate of 15.2% in SARS-CoV-2 infected pregnant women²³. In addition, a systematic review found the preterm rate was 14.3%, preeclampsia (5.9%), miscarriage (14.5%), preterm premature rupture of membranes (9.2%), and fetal growth restriction (2.8%). Among the 19 pregnant cases, 56.9% were delivered by cesarean, 31.3% were admitted to ICU, and 2.7% died²¹. Wei *et al.*, also found that COVID-19 was associated with preeclampsia (OR 1.33, 95% CI 1.03 to 1.73). also a previous study in Nepal showed an increase in stillbirth during the COVID-19 pandemic compared with before and Antoun *et al.* also reported preterm birth in 36.8%. Cesarean delivery was in 84 % of COVID-19 pregnant women in the UK²⁴.

A previous study showed no significant differences in preterm birth and stillbirth rates before and during the COVID-19²⁵. This decrease in preterm rates was most likely due to a mix of variables, including the cessation of work, increased hygiene measures, social distancing, which resulted in fewer infections by common

pathogens. The present study found that the most common neonatal outcomes were NICU admission for treatment (31.25%), required mechanical ventilation (12.5%), low birth weight (18.75%), ARDS (2.6%), and death (6.25%). None of the participants reported asphyxia or pneumonia. An Apgar score was observed in sixteen (21.3%) women. The Mean \pm SD of Apgar score at one minute was 8.93 ± 1.913 , while The Mean \pm SD of the Apgar score at five minutes was 9.06 ± 1.691 , which is considered normal. These findings were quite similar to a systematic review which found that 26.5% of neonates had fetal distress, 11.3% needed NICU admission, and only 1.4% of them had neonatal asphyxia. An Apgar score was < 7 at 5 minutes in only 1.2% of the neonates²¹. Also, in line with a previous study which reported that covid 19 confirmed pregnant women had a higher rate of neonatal intensive care unit admissions (23 vs. 18, 9.3% vs. 2.4%, an OR 4.62, 95% CI 2.43–8.94, $p < 0.001$)²⁶. In accordance with another study that reported a low birth weight (5–43%) among neonates of covid19 pregnant women²⁷.

Limitation

The study used a cross-sectional descriptive study design, which cannot investigate a causal relationship between COVID19 and adverse perinatal outcomes. Although the sample size is not considered large, we included all pregnant women with COVID19 admitted to the hospital during the study time.

Strength

The study's findings could help clinicians effectively manage the pregnancies complicated with COVID19 by providing baseline data describing the presentation and adverse perinatal outcomes of covid 19 during pregnancy.

Ethical considerations

In line with the guidelines of the Helsinki Declaration and items of the STROBE statement, an approval was granted by the institutional review board and the research ethics committee, Faculty of Nursing, Suez Canal university approved the current study on 26/4/2021 by code 104/4(2021). The researchers obtained an official letter from the dean of the Faculty of Nursing directed to the head

of the isolation department to facilitate data collection.

Conclusion

A pregnant woman with Covid-19 seems to have a high risk of abortion, preterm birth. Their neonates are at a high risk of NICU admission and low birth weight. Consequently, covid19 pregnant cases should be considered a high-risk group.

Recommendations

Hence, collating scientific evidence concerning the pandemic is imperative. A systematic review evaluating the maternal and perinatal outcomes among women diagnosed with COVID-19 is highly recommended. Our results suggest the need to address the role of the COVID19 vaccine during pregnancy to reduce adverse maternal and neonatal outcomes.

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