

Original article

Maternal Mortality and Risk Factors among Pregnant Women with COVID-19 in Isolation Centers of Al-Bayda, Derna, and Tobrouk

Abtisam Alsaliheen^{*} , Amna Kalefa , Halima Alhassi 

Department of Obstetrics and Gynecology, Faculty of Medicine, Omar Al-Mukhtar University, Al-Bayda, Libya
Corresponding Email. ebtesam.altalhy@omu.edu.ly

Abstract

The COVID-19 pandemic has shown high mortality and morbidity among pregnant women worldwide. This study aimed to estimate the case fatality rate and identify risk factors among pregnant women with COVID-19 infection admitted to the ICU and isolation centers in Al-Bayda, Derna, and Tobrouk, Libya, from 2020 to 2021. A case series study was conducted reviewing records of pregnant women admitted to isolation centers for COVID-19 infection. Statistical analysis was performed using SPSS 23.0. COVID-19 in pregnancy demonstrated a high maternal mortality rate of 14.3% and a high rate of fetal loss at 25%. Lower hemoglobin levels, higher leukocyte count, and elevated erythrocyte sedimentation rate were significantly associated with complicated cases. COVID-19 in pregnancy has a high maternal mortality rate and a high rate of fetal loss. The finding of hemoglobin, leukocyte count, and erythrocyte sedimentation rate differences is worthy of further research in predicting mortality and disease severity for similar infections among pregnant women.

Keywords. COVID-19, Pregnancy, Maternal Mortality, SARS-CoV-2, Isolation Centers.

Introduction

In December 2019, the world faced a serious public health threat from a new virus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Originating from Wuhan, China, this highly infectious virus quickly spread across the globe. Within a few months, the World Health Organization (WHO) had labeled the Coronavirus disease 2019 (COVID-19) a pandemic. Estimates suggest that around 5.9 million individuals have died globally, although some studies propose the actual number could be significantly higher [1].

Pregnant women are particularly vulnerable to both the transmission of the virus and severe outcomes from COVID-19, especially in the third trimester. This increased risk stems from the immune system being naturally suppressed during pregnancy and changes in cardiovascular and pulmonary function that occur due to the growing uterus and developing fetus. The journey to manage COVID-19 in pregnant women was complicated by challenges like the "protection by exclusion" issue, which initially restricted pregnant women from potentially beneficial treatments. These obstacles made it difficult to evaluate the safety and effectiveness of COVID-19 medications during pregnancy [2]. This study aims to estimate the case fatality rate for cases of pregnant women with COVID-19 infection admitted to the ICU and isolation centers of Al-Bayda, Derna, and Tobrouk from 2020 to 2021.

Methods

Study Design and Setting

This case series study included a review of medical records of pregnant women admitted to COVID-19 isolation centers in Al-Bayda, Derna, and Tobrouk, Libya, during the period from August 2020 to October 2021. The study population consisted of pregnant women with confirmed COVID-19 infection who were admitted to intensive care units and isolation centers.

Data Collection

Data were extracted from archived medical files and statistical records, including maternal age, gestational age, date of death (antenatal or postpartum), presence of comorbidities, and various clinical and laboratory parameters. Ethical approval was obtained from the directors of the isolation centers and the Libyan Ministry of Health.

Statistical Analysis

Statistical analysis was performed using SPSS software version 23.0 (IBM). Chi-square test, Fisher's exact test, Student's t-test, and Mann-Whitney U test were used for comparing variables across groups as appropriate. A p-value of less than 0.05 was considered statistically significant.

Results

Study Population Characteristics

The study included 28 pregnant women with COVID-19 infection. The mean age of participants was 31.5 years (range: 22-45 years), with 32.1% being of advanced maternal age (35+ years). The mean parity was 3.0, and the mean weight was 82.6 kg. Most participants (89.3%) had good socioeconomic status (Table 1).

Table 1. Study Population Characteristics

	N	%
Total number	28	
Age (year)		
Range	22 – 45	
Mean ± SD	31.5 ± 6.75	
Median	30	
Weight (kg)		
Range	60 – 112	
Mean ± SD	82.6 ± 13.27	
Median	84	
Parity		
Range	0 – 9	
Mean ± SD	3.0 ± 2.44	
Median	2	
Maternal age		
Optimal maternal age	19	67.9
Advanced Maternal age	9	32.1
Blood group		
A	6	21.4
B	5	17.9
AB	3	10.7
O	14	50
RH factor		
Positive	27	96.4
Negative	1	3.6
Medical history		
Bronchial asthma	5	17.9
Diabetes mellitus	5	17.9
Hypertension	1	3.6
Socioeconomic status		
Good	25	89.3
Poor	3	10.7
Time of diagnosis of COVID-19		
First	3	10.7
Second	11	39.3
Third	12	42.9
Postpartum	2	7.1
Pregnancy complicated		
Yes	16	57.1
No	12	42.9

Clinical Presentation

Most study participants (89.3%) complained of shortness of breath, while 82.1% reported cough. Other symptoms included vomiting (14.3%), diarrhea (7.1%), and various types of pain (14.3%). The mean oxygen saturation (PO₂ sat) was 74.7%, confirming the severity of infection among the study population. Mechanical ventilation was required in 17.9% of cases (Table 2).

Table 2. Clinical presentation of case study

	N	%
Symptoms		
Cough	23	82.1
Shortness of breath	25	89.3

	Vomiting	4	14.3
	Diarrhea	2	7.1
	Various types of pain	4	14.3
PO2 saturation			
	Missed	3	
	Range	45 – 88	
	Mean ± SD	74.7±12.59	
	Median	75	
	Mechanical ventilator required	5	17.9

Laboratory Findings

Laboratory analysis revealed a mean hemoglobin level of 10.2 g/dL, a mean white blood cell count of 15.8 x 10³/mL, and a mean platelet count of 219.6 x 10³/mL. Inflammatory markers were elevated, with a mean CRP of 122.2 mg/dL, a mean ESR of 53.6 mm/hour, and a mean D-dimer of 5.9 mg/L (Table 3).

Table 3. Laboratory Findings

	Missing values	Range	Mean ± SD	Median
Hemoglobin (gm/dL)	0	6.0 – 13.0	10.2 ± 1.67	10.45
WBC (x 10 ³ / mL)	0	7 – 28	15.8 ± 5.60	15.00
Platelets count (x 10 ³ / mL)	3	90 - 350	219.6 ± 78.03	218.00
CRP (mg/dL)	1	20 - 360	122.2 ± 90.89	108.00
ESR (mm/ Hour)	8	16 – 90	53.6 ± 30.48	57.50
D-Dimer (mg/ L)	8	22 – 45	5.9 ± 4.89	

Maternal Mortality Analysis

The case fatality rate was 14.3% (4 maternal deaths among 28 cases). Among maternal deaths, 75% required mechanical ventilation, and all deceased patients experienced shortness of breath. Notably, hemoglobin levels were significantly lower in maternal deaths (8.9 g/dL) compared to survivors (10.4 g/dL), with a p-value of less than 0.001 (Tables 4 & 5).

Table 4. Study group outcome

Outcome	N	%
Mortality outcome		
A live	24	85.7
Death	4	14.3
Pregnancy outcome		
Normal vaginal delivery	14	50.0
Cesarean section	7	25.0
Intrauterine death	4	14.3
Miscarriage	3	10.7

Table 5. Maternal Mortality Analysis

Characteristic	Maternal death		P
	Yes	No	
Demographic and general characteristics			
Age (years)	32.3 ± 2.6 (32.0)	31.4 ± 7.2 (29.5)	0.666 T
Advanced maternal age	25.0%	33.3%	1.000 F
Socio-economic status (good)	100.0%	87.5%	1.000 F

AB blood type	0.0%	12.5%	1.000 F
Rh positive	100.0%	95.8%	1.000 F
Multiparous	75.0%	66.7%	1.000 F
Weight (kilogram)	79.5±3.3 (80.0)	83.1±14.3 (85.0)	0.296 T
Pre-existing medical disease	0.0%	45.8%	0.132 F
Pregnancy related factors			
Early pregnancy	25.0%	54.2%	0.596 F
Pregnancy complications Reported	50.0%	58.3%	0.583 F
Clinical manifestations			
Vomiting	0.0%	16.7%	1.000 F
Diarrhea	0.0%	8.3%	1.000 F
Shortness of breath	100.0%	87.5%	1.000 F
Cough	50.0%	87.5%	0.135 F
Any pain	0.0%	16.7%	1.000 F
Ventilator use reported	75.0%	8.3%	0.011 F
PO2 sat %	59.3±24.8 (45.0)	76.8±9.2 (76.5)	0.347 T
Hematologic indices			
Hemoglobin	8.9±0.3 (9.0)	10.4±1.7 (11.0)	<0.001 T
WBCs	17.5±7.0 (18.5)	15.5±5.5 (14.5)	0.624 T
Platelets count	169.7±117.0 (115.0)	226.4±72.5 (220.5)	0.246 T
Inflammatory markers			
CRP	247.7±169.3 (330.0)	106.5±67.4 (94.0)	0.188 M
ESR	63.3±37.9 (80.0)	51.9±30.1 (55.0)	0.414 M
D. Dimer	8.1±2.5 (9.0)	5.5±5.2 (4.5)	0.100 M

P: Probability value, significance set at < 0.05. T: Independent Student's t-test F: Fisher's Exact test M: Mann-Whitney U test

Fetal Loss Analysis

Total fetal loss occurred in 7 cases (25%), including intrauterine fetal death and abortion. Women with fetal loss had significantly higher white blood cell counts ($19.4 \times 10^3/\text{mL}$ vs. $14.6 \times 10^3/\text{mL}$, $p=0.045$) and significantly higher erythrocyte sedimentation rates (84.0 mm/hour vs. 43.5 mm/hour, $p=0.009$) compared to those with live births.

Table 6. Fetal Loss Analysis

Characteristic	Fetal death		P
	Yes	No	
Demographic and general characteristics			
Age (years)	33.0±7.4 (34.0)	31.0±6.6 (30.0)	0.507 T
Advanced maternal age	42.9%	28.6%	0.646 F
Socio-economic status (good)	85.7%	90.5%	1.000 F
AB blood type	0.0%	14.3%	0.551 F
Rh positive	100.0%	95.2%	1.000 F
Multiparous	57.1%	71.4%	0.646 F
Weight (kilogram)	76.7±13.4 (75.0)	84.5±12.9 (85.0)	0.182 T
Pre-existing medical disease	57.1%	33.3%	0.381 F
Pregnancy related factors			
Early pregnancy	57.1%	47.6%	1.000 F

Pregnancy complications Reported	85.7%	47.6%	0.184 F
Clinical manifestations			
Vomiting	42.9%	4.8%	0.038 F
Diarrhea	28.6%	0.0%	0.056 F
Shortness of breath	71.4%	95.2%	0.145 F
Cough	42.9%	95.2%	0.008 F
Any pain	14.3%	14.3%	1.000 F
Ventilator use reported	42.9%	9.5%	0.082 F
PO2 sat %	72.0±17.4 (78.0)	75.4±11.6 (75.0)	0.605 T
Hematologic indices			
Hemoglobin	9.7±1.7 (9.0)	10.3±1.7 (11.0)	0.396 T
WBCs	19.4±3.9 (18.9)	14.6±5.6 (14.0)	0.045 T
Platelets count	234.3±95.6 (263.5)	214.9±74.1 (216.0)	0.605 T
Inflammatory markers			
CRP	167.5±91.0 (116.0)	109.3±88.7 (80.0)	0.095 M
ESR	84.0±5.5 (80.0)	43.5±28.5 (20.0)	0.009 M
D. Dimer	7.4±3.0 (9.0)	5.1±5.6 (3.2)	0.062 M

P: Probability value, significance set at < 0.05 . *T*: Independent Student's *t*-test *F*: Fisher's Exact test *M*: Mann-Whitney *U* test

Discussion

Pregnancy loss and considerably high maternal mortality are features of COVID-19 during pregnancy. This study is a case series study that aims to assess and analyze the outcomes of this serious infection. The total series included 28 women admitted to isolation centers and intensive care units in three hospitals in the period from August 2020 to October 2021. This study reveals alarmingly high maternal mortality (14.3%) and fetal loss (25%) rates among pregnant women with COVID-19 in Libyan isolation centers. These findings are consistent with international reports from the early pandemic period. A study by Blitz et al. (2020) [3] in New York reported maternal death in 15% of ICU admissions and 25% among those requiring mechanical ventilation.

Hantoushzadeh, S et al (2020) [4] described maternal and perinatal outcomes and death in a case series of pregnant women with COVID-19 disease. Among 9 pregnant women with severe COVID-19 disease, at the time of reporting, 7 of 9 died, resulting in maternal deaths owing to COVID-19 disease. Until rigorously collected surveillance data emerge, it is prudent to be aware of the potential for maternal death among pregnant women diagnosed as having COVID-19 disease in their second or third trimester. Gholami, R. et al. (2023) [5] compared the pregnancy outcomes of Iranian pregnant women in the first year of the pandemic with the previous year. The study was a prospective cross-sectional study performed to compare the pregnancy outcome during the COVID-19 pandemic among Iranian pregnant women who gave birth during the pandemic and one year before the pandemic (2019–2020 and 2020–2021), and concluded that the COVID-19 pandemic has affected the pregnancy outcome by increasing morbidities and complications during pregnancy, birth, and postpartum. The significantly lower hemoglobin levels observed in maternal deaths highlight the importance of anemia as a risk factor for severe COVID-19 outcomes in pregnancy. This finding aligns with the known physiological changes during pregnancy, where increased oxygen demands and gestational anemia can exacerbate hypoxia caused by respiratory infections.

The elevated inflammatory markers (WBC and ESR) in women with fetal loss suggest that heightened inflammatory response may contribute to adverse pregnancy outcomes. This finding underscores the importance of monitoring inflammatory markers in pregnant women with COVID-19. Importantly, none of the study participants had received a COVID-19 vaccination, as vaccines were not widely available during the study period (2020-2021). The study by Favilli, A. et al (2023) [6] concluded that vaccination remains the real first line of effective prevention that should be followed. Overall, many studies and articles on COVID-19 vaccination and pregnancy indicate that vaccines are safe and effective, so it is imperative to encourage pregnant women to get vaccinated.

Conclusion

COVID-19 in pregnancy has a high maternal mortality rate and a high rate of fetal loss. The finding of hemoglobin, leukocyte count, and erythrocyte sedimentation rate differences is worthy of further research in predicting mortality and disease severity for similar infections among pregnant women. Careful monitoring of pregnant women with respiratory conditions is essential, particularly of oxygen saturation levels. Further well-designed research is needed for a more comprehensive evaluation of risk factors and optimal management strategies.

Conflicts of Interest

The authors declare no conflicts of interest.

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