

Clinical characteristics of COVID-19 in pregnant women: A retrospective descriptive single-center study from a tertiary hospital in Muscat, Oman

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Since February 24, 2020, coronavirus disease 2019 (COVID-19) cases have been continually reported in Oman, with a mortality rate of 0.7%.¹ This retrospective descriptive study aims to describe maternal and neonatal outcomes in pregnant women presenting with COVID-19 at a tertiary care center in Muscat, Oman. Additionally, the present study highlights the specific clinical features and management of COVID-19 in this part of the world.

Women in all trimesters of pregnancy, and during the immediate postpartum period, who attended The Royal Hospital, Muscat, Oman from March 24 to July 31, 2020, with laboratory-confirmed severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection were recruited for this study. Real time polymerase chain reaction (RT-PCR) of nasopharyngeal and oropharyngeal swabs, using the Liferiver® Novel Coronavirus Real Time Multiplex RT-PCR Kit (Biotechnology Co., Shanghai, China), was used to confirm the diagnosis. Disease severity was assessed using the categories and definitions specified by the US National Institutes of Health COVID-19 Treatment Guidelines Panel.² Data were retrieved from electronic records. For the purpose of statistical analysis, asymptomatic patients, those with mild illness, and those with moderate, severe, or critical illness were categorized as groups 1, 2, and 3, respectively.

Descriptive statistics were used to describe and present the data. Statistical analyses were conducted using STATA version 13.1 (STATA Corp., College Station, TX, USA). Ethical approval for this study was

obtained from the Royal Hospital's Scientific Research and Ethical Committee (#SRC/72/2020).

The present study identified 60 pregnant women positive for COVID-19, who constituted 2.1% of the 2901 deliveries in the hospital during the study period. Sixteen (27%) women were asymptomatic, 34 (57%) had mild illness, 4 (6.7%) had moderate illness, 5 (8.3%) had severe illness, and 1 (1.7%) was critically ill. A total of 31 patients (52%) were managed at home, 22 (37%) patients required inpatient care, and 7 (12%) required Intensive Care Unit (ICU) admission.

Demographic details, clinical characteristics, and laboratory parameters of the cohort, stratified by COVID-19 disease severity, are outlined in Table 1. Median gestational age at presentation was 35 (30–37) weeks. There were no statistically significant differences between the groups with regards to age ($P=0.401$), parity ($P=0.223$), and body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters) ($P=0.349$). Notably, 30% ($n=18$) of patients presented with fever, 40% ($n=24$) with cough, and 13% ($n=8$) with shortness of breath (SOB). A systematic review³ published in July 2020, which enrolled 2567 COVID-19-positive pregnancies, reported that most women presented in their third trimester, and the most common clinical features were fever, cough, and SOB, as observed in our cohort.

The most common laboratory abnormalities noted in the meta-analysis by Khalil et al.³ were elevated C-reactive protein,

TABLE 1 Demographics, clinical characteristics, and laboratory and radiological features stratified by COVID-19 disease severity

Characteristic, median (IQR) unless specified otherwise [non-missing count]	All (N=60)	Group 1 Asymptomatic (n=16)	Group 2 Mild (n=34)	Group 3 Moderate/Severe/ Critical (n=10)	P value
Age (years), mean \pm SD	32 \pm 6	32 \pm 7	31 \pm 6	34 \pm 5	0.401
BMI [48/60], mean \pm SD, kg/m ²	31 \pm 6	29 \pm 5	31 \pm 7	33 \pm 6	0.349
Gestational age					
Median (IQR), weeks	35 (30–37)	36 (32–38)	36 (31–37)	33 (25–35)	0.175
Absolute range	7–41	7–38	16–41	22–37	
Parity, median (IQR)	2 (1–4)	2 (1–3)	2 (1–3)	4 (2–5)	0.223
Presentation location					
Emergency	26 (43%)	4 (25%)	13 (38%)	9 (90%)	0.004
Delivery suite	20 (33%)	10 (63%)	10 (29%)	0	
Postpartum	3 (5%)	0	2 (5.9%)	1 (10%)	
Outpatient department	6 (10%)	0	6 (18%)	0	
Elective admission	5 (8.3%)	2 (13%)	3 (8.8%)	0	
Comorbidities					
Hypertension	3 (5%)	2 (13%)	1 (2.9%)	0	0.240
DM	5 (8.3%)	3 (19%)	2 (5.9%)	0	0.275
GDM	15 (25%)	3 (19%)	9 (26%)	3 (30%)	0.778
Hematological disease	8 (13%)	1 (6.3%)	5 (15%)	2 (20%)	0.586
Signs and symptoms					
Fever	18 (30%)	0	13 (38%)	5 (50%)	0.002
Cough	24 (40%)	0	17 (50%)	7 (70%)	<0.001
Rhinorrhea/sore throat	13 (22%)	0	13 (38%)	0	0.001
Myalgia	8 (13%)	0	7 (21%)	1 (10)	0.123
Fatigue	1 (1.7%)	0	1 (2.9%)	0	1.000
Headache	9 (15%)	0	7 (21%)	2 (20%)	0.116
Shortness of breath	8 (13%)	0	0	8 (80%)	<0.001
Vomiting/diarrhea	12 (20%)	0	11 (32%)	1 (10%)	0.011
Anosmia/ageusia	5 (8.3%)	0	5 (15%)	0	0.218
Hemoglobin, g/dL [55/60]	11 (10.2–11.8)	11.8 (9.9–12.4)	11.4 (10.6–11.8)	10.3 (10.1–10.5)	0.043
<11, n (%)	26 (47%)	5 (36%)	12 (39%)	9 (90%)	0.009
\geq 11, n (%)	29 (53%)	9 (64%)	19 (61%)	1 (10%)	
White blood cell count, $\times 10^9$ /L [55/60]	6.9 (4.9–9.5)	7.7 (5–9.9)	6.4 (4.7–9)	6.9 (5.7–9.6)	0.488
\leq 9.5, n (%)	43 (78%)	9 (64%)	27 (87%)	7 (70%)	0.175
>9.5, n (%)	12 (22%)	5 (36%)	4 (13%)	3 (30%)	
Absolute neutrophil count, $\times 10^9$ /L [55/60]	4.9 (3.2–6.7)	4.5 (2.7–6.9)	4.9 (3.1–6.6)	5.7 (4.3–6.7)	0.453
1.5–3.2, n (%)	14 (25%)	5 (36%)	9 (29%)	0	0.086
>3.2, n (%)	41 (75%)	9 (64%)	22 (71%)	10 (100%)	
Platelet count, $\times 10^9$ /L [55/60]	242 (178–298)	279 (246–314)	226 (156–261)	204 (158–327)	0.024
<125, n (%)	4 (7.3%)	0	4 (13%)	0	0.293
125–400, n (%)	47 (85%)	12 (86%)	26 (84%)	9 (90%)	
>400, n (%)	4 (7.3%)	2 (14%)	1 (3.2%)	1 (10%)	
C-reactive protein, mg/dL [31/60]	20 (11–87)	5.7 (4–7.4)	17 (11–45)	84 (40–151)	0.016

(Continues)

TABLE 1 (Continued)

Characteristic, median (IQR) unless specified otherwise [non-missing count]	All (N=60)	Group 1 Asymptomatic (n=16)	Group 2 Mild (n=34)	Group 3 Moderate/Severe/ Critical (n=10)	P value
<6, n (%)	5 (16%)	1 (50%)	4 (21%)	0	0.121
≥6, n (%)	26 (84%)	1 (50%)	15 (79%)	10 (100%)	
Serum lactate, mmol/L [9/60]	1.1 (0.8–1.5)	0	0.8 (0.7–1.3)	1.4 (1.1–1.5)	0.561
Lactate dehydrogenase, U/L [20/60]	210 (167–343)	152 (140–163)	202 (143–308)	297 (224–500)	0.046
<250, n (%)	12 (60%)	2 (100%)	7 (70%)	3 (38%)	0.339
≥250, n (%)	8 (40%)	0	3 (30%)	5 (62%)	
Ferritin, g/L [17/60]	66 (39–115)	0	58 (26–90)	85 (53–268)	0.149
<600, n (%)	16 (94%)	0	9 (100%)	7 (87%)	0.471
≥600, n (%)	1 (5.9%)	0	0	1 (13%)	
Corrected calcium, mmol/L [11/60]	2.11 (2–2.33)	2.28 (2.28–2.28)	2.11 (1.98–2.23)	2.05 (2–2.17)	0.447
≤2.15, n (%)	6 (55%)	0	2 (67%)	5 (57%)	1.000
>2.15, n (%)	5 (45%)	1 (100%)	1 (33%)	3 (43%)	
eGFR, ml/min/1.73m ² [36/60]	90 (90–90)	90 (90–90)	90 (90–90)	90 (90–90)	0.639
D-Dimer, g/mL [15/60]	1.67 (1.03–4.02)	1.67 (1.67–1.67)	1.42 (0.91–7.62)	1.8 (1.03–4.02)	0.938
≤0.55, n (%)	1 (6.7%)	0	1 (14%)	0	1.000
>0.55, n (%)	14 (93%)	1 (100%)	6 (86%)	7 (100%)	
Alanine amino transferase, IU/L [39/60]	16 (10–19)	20 (9–42)	12 (10–17)	17 (15–23)	0.156
>56, n (%)	2 (5.1%)	1 (13%)	1 (4.8%)	0	0.433
Aspartate amino transferase, IU/L [14/60]	112 (80–199)	213 (199–238)	103 (87–187)	80 (36–108)	0.053
>40, n (%)	12 (86%)	3 (100%)	6 (100%)	3 (60%)	0.243
Radiology findings, [19/60]					
Normal, n (%)	9 (47%)	1 (100%)	7 (70%)	1 (12%)	0.042
Unilateral lung involvement, n (%)	2 (11%)	0	1 (10%)	1 (12%)	
Bilateral lung involvement, n (%)	8 (42%)	0	2 (20%)	6 (75%)	
ECG, abnormal, n (%) [10/60]	1 (10%)	0	1 (33%)	0	0.300

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); DM, diabetes mellitus; ECG, electrocardiogram; eGFR, estimated glomerular filtration rate; GDM, gestational diabetes mellitus; IQR, interquartile range; SD, standard deviation.

Note: Percentages might not add up to 100% due to rounding to the nearest digit.

transaminases, and lymphopenia, mirroring our results. We also noted anemia in 26 (47%) patients. This may be attributed to the high prevalence of gestational anemia among pregnant Omani women (42%).⁴

Obstetric outcomes are detailed in Table 2. The rate of miscarriage in the present cohort was 6.7% (n=4). Although it has been hypothesized that Treg/Th17 cell imbalance in COVID-19 might potentially be associated with adverse pregnancy outcomes such as pregnancy loss,⁵ we did not find an increased rate of miscarriage in our cohort. Yan et al.⁶ also stated that the risk of spontaneous abortion does not increase in pregnant women with COVID-19 when compared to the general population.

A hospital-based study has reported that approximately 10% of births in Oman are preterm births.⁷ In the current study, 30% (n=18) of births were preterm, of which 14 (78%) were spontaneous and 4 (22%) were iatrogenic. In a systematic review published from

United Kingdom, Khalil et al.³ reported that preterm birth before 37 weeks of gestation was common (22%), and usually medically indicated (18%).

The instrumental delivery rate (8.5%) and lower segment cesarean section (LSCS) rate (42%) in our cohort are above the hospital averages of 5% and 22%, respectively. Women in group 3 had a higher rate of emergency LSCS (57%) compared to women in groups 1 and 2 (10/50, 20%). LSCS rates for women with confirmed COVID-19 infection ranged from 43–92% in various studies.⁸ The higher rates of cesarean section in cases of moderate and severe disease may be attributed to concerns regarding maternal respiratory compromise.⁸ However, in our series, out of the 20 LSCS performed, only 3 (15%) were attributed to COVID-19 severity and 17 (85%) were for obstetric indications.

One woman had a macerated stillbirth. There were no instances of neonatal death or neonatal depression in this cohort. Of the five

TABLE 2 Obstetric outcomes stratified by COVID-19 disease severity

Characteristic, <i>n (%) unless specified otherwise</i> [non-missing count]	All (N=60)	Group 1 Asymptomatic (n=16)	Group 2 Mild illness (n=34)	Group 3 Moderate/ Severe/Critical illness (n=10)	P value
Pregnancy outcome [59/60]					
Term delivery (37–41 weeks)	29 (49%)	7 (44%)	20 (61%)	2 (20%)	0.057
Late preterm delivery (34–36 + 6)	14 (24%)	6 (38%)	5 (15%)	3 (30%)	
Early preterm delivery (24–33 + 6)	4 (6.8%)	0	3 (9.1%)	1 (10%)	
Second trimester miscarriage	2 (3.4%)	0	1 (3.0%)	1 (10%)	
First trimester miscarriage	2 (3.4%)	2 (13%)	0	0	
Ongoing pregnancy	8 (14%)	1 (6.3%)	4 (12%)	3 (30%)	
Indication for delivery [48/60]					
Maternal COVID-19 indication	3 (6.3%)	0	0	3 (43%)	0.020
Maternal obstetric indication	22 (46%)	5 (38%)	15 (54)	2 (29%)	
Fetal indication	4 (8.3%)	1 (7.7%)	2 (7.1%)	1 (14%)	
Coming in labor	19 (40%)	7 (54%)	11 (39%)	1 (14%)	
Mode of delivery [48/60]					
Normal vaginal delivery	24 (50%)	5 (38%)	18 (64%)	1 (14%)	0.031
Instrumental delivery	4 (8.3%)	3 (23%)	0	1 (14%)	
Elective LSCS	6 (13%)	2 (15%)	3 (11%)	1 (14%)	
Emergency LSCS	14 (29%)	3 (23%)	7 (25%)	5 (57%)	
Amniotic fluid, meconium stain, [7/47]	7 (15%)	5 (38%)	2 (7.1%)	0	0.029
Maternal complication [50/60]					
No	35 (70%)	9 (64%)	22 (76%)	4 (57%)	0.510
Yes	15 (30%)	5 (36%)	7 (24%)	3 (43%)	
PPROM	1 (2.0%)	0	1 (3.5%)	0	
PPROM/preeclampsia	1 (2.0%)	0	1 (3.5%)	0	
Preterm labor	8 (16%)	4 (29%)	3 (10%)	1 (14%)	
Preterm labor/preeclampsia	1 (2.0%)	0	1 (3.5%)	0	
Postpartum hemorrhage/ preeclampsia	1 (2.0%)	0	1 (3.5%)	0	
Preeclampsia/pulmonary embolism	1 (2.0%)	0	0	1 (14%)	
Pulmonary embolism/pelvic hematoma	1 (2.0%)	0	0	1 (14%)	
Miscarriage	1 (2.0%)	0	1 (3.5%)	0	
Fetal outcome					
Macerated stillbirth [47/60]	1 (2.1%)	0	1 (3.6%)	0	1.000
LBW < 2500g [47/60]	15 (32%)	6 (46%)	5 (18%)	4 (67%)	0.023

Abbreviations: LBW, low birthweight; LSCS, lower segment cesarean section; NICU, neonatal intensive care unit; PPROM, preterm premature rupture of the membranes.

Note: Percentages might not add up to 100% due to rounding to the nearest digit.

babies admitted for prematurity care, three were born to mothers from group 3. A COVID-19 test was performed for four neonates and all reported negative results. Histopathology of placentae (13/48 deliveries) did not reveal any specific pathological pattern. Due to sparse data, we are not able to comment on vertical transmission risk.

Complications related to COVID-19 were managed by a multidisciplinary team which included subspecialties. There were

3 (5%) cases with severe pneumonia, 1 (1.7%) with acute respiratory distress syndrome, 1 (1.7%) with septic shock, 1 (1.7%) with disseminated intravascular coagulation, and 2 (3.3%) with postpartum hemorrhage. Four (6.7%) patients developed pre-eclampsia, and 2 (3.3%) had pulmonary embolism. SARS-CoV-2 binds to angiotensin-converting enzyme receptor-2 (ACE2), thus lowering angiotensin-converting enzyme levels. The resultant endothelial dysfunction, along with the procoagulant nature of

pregnancy, potentially increases the risks of pre-eclampsia and thromboembolic disease.⁹

Being a tertiary center with about 800 deliveries per month, our ICU admission rate is approximately 3–4 (0.6%) patients per month. Out of the 60 COVID-19-positive women, 7 (12%) required ICU admission, of which 4 (6.7%) were primarily admitted due to complications associated with COVID-19. There was no maternal mortality in this cohort. The Center for Disease Control and Prevention in the US reported that after adjusting for age, presence of underlying medical conditions, and race/ethnicity, pregnant women were more likely to be admitted to the ICU than non-pregnant women. However, their risk of mortality was not increased.² An Iranian case series¹⁰ reported maternal deaths in seven of nine pregnant women with critical COVID-19.

In conclusion, the risk of preterm labor, pre-eclampsia, emergency LSCS, instrumental delivery, thromboembolic complications, and ICU admissions were increased in pregnant women with COVID-19 in the present cohort.

AUTHOR CONTRIBUTIONS

JS was responsible for the study design, planning, data collection, and manuscript writing. MAS contributed to the study conception and design, planning, and critical review of the manuscript. FK contributed to the study design and critical review of the manuscript. SAAU was responsible for data collection and critical review of the manuscript. IA-Z contributed to data management and critical review of the manuscript. All authors contributed to and approved of the final version of the manuscript.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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