

Article type : Brief Communication

BRIEF COMMUNICATION

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

Jayasree Santhosh^{1,*}, Mouza Al Salmani², Faryal Khamis³, Salwa Ali Al Ubaidani⁴, Ibrahim Al-Zakwani⁵

¹High Risk Pregnancy, Department of OB-GYN, Royal Hospital, Ministry of Health, Muscat, Oman

²Fetal medicine, Department of OB-GYN, Royal Hospital, Ministry of Health, Muscat, Oman

³Adult Infectious Diseases, Department of Medicine, Royal Hospital, Ministry of Health, Muscat, Oman

⁴Department of Clinical genetics, National Genetic center, Ministry of Health, Muscat, Oman

⁵Department of Pharmacology & Clinical Pharmacy, College of Medicine & Health Sciences, Sultan Qaboos University, Muscat, Oman

***Correspondence**

Jayasree Santhosh, PO Box 846, Flat NO 21, Office Avenue 2, Al Habib buildings, Bowsher, Muscat, Oman.

Email: santhosh.jayasree@hotmail.co.uk

Keywords

COVID-19; Pneumonia; Pregnancy; Preterm; SARS-CoV-2

Synopsis

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1002/IJGO.13427](https://doi.org/10.1002/IJGO.13427)

This article is protected by copyright. All rights reserved

The risk of preterm labor, pre-eclampsia, lower segment cesarean section, thromboembolic complications, and ICU admissions are increased for pregnant women with COVID-19.

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 review[3] 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, 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 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 series[10] 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. AS 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.

References

1. Worldometer COVID 19 data. www.worldometers. Accessed August 27, 2020.
2. National Institutes of Health. COVID-19 Treatment Guidelines Panel. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines. <https://www.covid19treatmentguidelines.nih.gov/>. Accessed September 2, 2020.
3. Khalil A, Kalafat E, Benlioglu C, et al. SARS-CoV-2 infection in pregnancy: A systematic review and meta-analysis of clinical features and pregnancy outcomes. *EClinical Medicine*. 2020;25:100446.
4. Seshan V, Alkhasawneh E, Al Kindi S, Al Simadi FA, Arulappan J. Can gestational anemia be alleviated with increased awareness of its causes and management strategies? Implications for health care services. *Oman Med J*. 2018;33:322–30.
5. Muyayalo KP, Huang DH, Zhao SJ, Xie T, Mor G, Liao AH. COVID-19 and Treg/Th17 imbalance: Potential relationship to pregnancy outcomes. *Am J Reprod Immunol*. 2020:e13304. doi:10.1111/aji.13304.
6. Yan J, Guo J, Fan C, et al. Coronavirus disease 2019 in pregnant women: A report based on 116 cases. *Am J Obstet Gynecol*. 2020; 223:111.e1–111.e14. doi:10.1016/j.ajog.2020.04.014.
7. Islam MM. Increasing incidence of infants with low birth weight in Oman. *Sultan Qaboos Univ Med J*. 2015;15:e177–e83.
8. Ryan GA, Purandare NC, McAuliffe FM, Hod M, Purandare CN. Clinical update on COVID-19 in pregnancy: A review article. *J Obstet Gynaecol Res*. 2020; 46:1235–45.
9. Klok FA, Kruip MJHA, van der Meer NJM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thromb Res*. 2020;191:145–7.

10. Hantoushzadeh S, Shamshirsaz AA, Aleyasin A, et al. Maternal death due to COVID-19. *Am J Obstet Gynecol*. 2020;223:109.e1–16.

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

Characteristic, <i>median (IQR) unless specified otherwise</i> [non-missing count]	All (N=60)	Group 1 Asymptomatic (n=16)	Group 2 Mild (n=34)	Group 3 Moderate (n=10)
Age (years), mean±SD	32±6	32±7	31±6	34±6
BMI [48/60], mean±SD, kg/m ²	31±6	29±5	31±7	33±6
<i>Gestational age</i>				
Median (IQR), weeks	35 (30–37)	36 (32–38)	36 (31–37)	33 (28–36)
Absolute range	7–41	7–38	16–41	22–41
Parity, median (IQR)	2 (1–4)	2 (1–3)	2 (1–3)	4 (1–5)
<i>Presentation location</i>				
Emergency	26 (43%)	4 (25%)	13 (38%)	9 (90%)
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
<i>Comorbidities</i>				
Hypertension	3 (5%)	2 (13%)	1 (2.9%)	0
DM	5 (8.3%)	3 (19%)	2 (5.9%)	0
GDM	15 (25%)	3 (19%)	9 (26%)	3 (30%)
Hematological disease	8 (13%)	1 (6.3%)	5 (15%)	2 (20%)
<i>Signs and symptoms</i>				
Fever	18 (30%)	0	13 (38%)	5 (50%)
Cough	24 (40%)	0	17 (50%)	7 (70%)
Rhinorrhea/sore throat	13 (22%)	0	13 (38%)	0
Myalgia	8 (13%)	0	7 (21%)	1 (10%)
Fatigue	1 (1.7%)	0	1 (2.9%)	0
Headache	9 (15%)	0	7 (21%)	2 (20%)
Shortness of breath	8 (13%)	0	0	8 (80%)
Vomiting/diarrhea	12 (20%)	0	11 (32%)	1 (10%)
Anosmia/ageusia	5 (8.3%)	0	5 (15%)	0
Hemoglobin, g/dL [55/60]	11 (10.2–11.8)	11.8 (9.9–12.4)	11.4 (10.6–11.8)	10.5 (9.5–11.5)
<11, n (%)	26 (47%)	5 (36%)	12 (39%)	9 (90%)
≥11, n (%)	29 (53%)	9 (64%)	19 (61%)	1 (10%)

White blood cell count, ×10 ⁹ /L [55/60]	6.9 (4.9–9.5)	7.7 (5–9.9)	6.4 (4.7–9)	6.9
≤9.5, n (%)	43 (78%)	9 (64%)	27 (87%)	7 (100%)
>9.5, n (%)	12 (22%)	5 (36%)	4 (13%)	3 (43%)
Absolute neutrophil count, ×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
1.5–3.2, n (%)	14 (25%)	5 (36%)	9 (29%)	0
>3.2, n (%)	41 (75%)	9 (64%)	22 (71%)	10
Platelet count, ×10 ⁹ /L [55/60]	242 (178–298)	279 (246–314)	226 (156–261)	20
<125, n (%)	4 (7.3%)	0	4 (13%)	0
125–400, n (%)	47 (85%)	12 (86%)	26 (84%)	9 (100%)
>400, n (%)	4 (7.3%)	2 (14%)	1 (3.2%)	1 (14%)
C-reactive protein, mg/dL [31/60]	20 (11–87)	5.7 (4–7.4)	17 (11–45)	84
<6, n (%)	5 (16%)	1 (50%)	4 (21%)	0
≥6, n (%)	26 (84%)	1 (50%)	15 (79%)	10
Serum lactate, mmol/L [9/60]	1.1 (0.8–1.5)	0	0.8 (0.7–1.3)	1.4
Lactate dehydrogenase, U/L [20/60]	210 (167–343)	152 (140–163)	202 (143–308)	29
<250, n (%)	12 (60%)	2 (100%)	7 (70%)	3 (100%)
≥250, n (%)	8 (40%)	0	3 (30%)	5 (71%)
Ferritin, g/L [17/60]	66 (39–115)	0	58 (26–90)	85
<600, n (%)	16 (94%)	0	9 (100%)	7 (100%)
≥600, n (%)	1 (5.9%)	0	0	1 (14%)
Corrected calcium, mmol/L [11/60]	2.11 (2–2.33)	2.28 (2.28–2.28)	2.11 (1.98–2.23)	2.0
≤2.15, n (%)	6 (55%)	0	2 (67%)	5 (71%)
>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
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
≤0.55, n (%)	1 (6.7%)	0	1 (14%)	0
>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
>56, n (%)	2 (5.1%)	1 (13%)	1 (4.8%)	0
Aspartate amino transferase, IU/L [14/60]	112 (80–199)	213 (199–238)	103 (87–187)	80
>40, n (%)	12 (86%)	3 (100%)	6 (100%)	3 (43%)
Radiology findings, [19/60]				
Normal, n (%)	9 (47%)	1 (100%)	7 (70%)	1 (14%)
Unilateral lung involvement, n (%)	2 (11%)	0	1 (10%)	1 (14%)
Bilateral lung involvement, n (%)	8 (42%)	0	2 (20%)	6 (86%)
ECG, abnormal, n (%) [10/60]	1 (10%)	0	1 (33%)	0

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.

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

TABLE 2 Obstetric outcomes stratified by COVID-19 disease severity

Characteristic, <i>n</i> (%) unless specified otherwise [non-missing count]	All (N=60)	Group 1 Asymptomatic (n=16)	Group 2 Mild illness (n=34)	Group 3 Moderate/Severe illness (n=10)
<i>Pregnancy outcome [59/60]</i>				
Term delivery (37–41 weeks)	29 (49%)	7 (44%)	20 (61%)	2 (20%)
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%)
<i>Indication for delivery [48/60]</i>				
Maternal COVID-19 indication	3 (6.3%)	0	0	3 (43%)
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%)
<i>Mode of delivery [48/60]</i>				
Normal vaginal delivery	24 (50%)	5 (38%)	18 (64%)	1 (14%)
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
<i>Maternal complication [50/60]</i>				
No	35 (70%)	9 (64%)	22 (76%)	4 (57%)
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
<i>Fetal outcome</i>				
Macerated stillbirth [47/60]	1 (2.1%)	0	1 (3.6%)	0
LBW <2500g [47/60]	15 (32%)	6 (46%)	5 (18%)	4 (67%)

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

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