

## COVID-19 infection in pregnancy: A case series from Derna, Libya

### Abstract

**Introduction:** Pregnant women are potentially a high-risk population during infectious disease outbreaks such as COVID-19, because of physiologic immune suppression in pregnancy. However, data on the morbidity and mortality of COVID-19 among pregnant women, compared to nonpregnant women, are lacking. We sought to describe the management of twenty-one pregnant women with COVID-19 infection.

**Methods:** A prospective chart review was conducted to identify pregnant women who presented with symptom and sign of COVID-19 and tested positive or highly suspected even if test was negative, from 15 June 2020 to 04 October 2021.

**Results:** Four women required non-invasive supplemental oxygen therapy and one required mechanical ventilation. One woman had a pulmonary embolism and expired after delivery.

**Conclusion:** Management of pregnant women with severe COVID-19 is complex and should involve multidisciplinary expertise. Avoiding early delivery may be a safe option. We recommend an individualized approach to care, including careful consideration of the expected risks and benefits of expectant obstetric management versus delivery.

**Keywords:** COVID-19, coronavirus, delivery, mechanical ventilation, pregnancy, thromboprophylaxis

**Abbreviations:** LSCS: lower segment caesarean section, APGAR: Apgar score, CPAP: continuous positive airway pressure, PPE: personal protective equipments, PCR: polymerase chain reaction, CRP C reactive protein, ESR: erythrocyte sedimentation rate, APTT: activated partial thromboplastin time, INR: international normalization ratio.

### Introduction

The World Health Organization (WHO) on March 11, 2020, has declared the novel coronavirus (COVID-19) outbreak a global pandemic (1). To date, a total of over 641 million COVID-19 cases and more than 6.6 million related deaths have been recorded globally. In Libya, over 705,000 cases and more than 6,000 related deaths have been recorded since the first case was reported in the country on 05 November 2022(2). Consequently, the whole population is thought susceptible to SARS-CoV-2 and it is suspected that pregnant women

are likely to be at increased risk of severe infections, with the potential for adverse maternal and perinatal outcomes (3). This concern is based on experience of the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), caused by related coronaviruses, which were found to be associated with worse outcome during pregnancy(4-7).

A recent systematic review by Yuan et al., (2021) regarding possibility of vertical transmission of COVID-19 during pregnancy reported that total of infection rate of newborns to infected mothers is low, and they believed that the risk of vertical transmission was small (8).

Available data on COVID-19 infection in pregnancy have not confirm an increased risk of infection in pregnancy, or substantial risk to newborns (9). However, pregnant women were more at risk with to get severe symptoms of COVID-19. There were many uncertainties on the standard of care for pregnant women with COVID-19 infection.

The Centers for Disease Control and Prevention (CDC) revealed that pregnant women may be at higher risk of intensive care unit (ICU) admission and mechanical ventilation than non-pregnant women after adjustment for demographic characteristics and comorbid conditions (10).

Clinical characters of COVID-19 infection in pregnancy are important for prognostication, health care guidelines and policy formulation.

The few studies done in Libya, though did not document any information on COVID-19 infection in pregnant women. Therefore, an urgent need to evaluate the clinical characteristics, and compare maternal and perinatal outcomes of COVID-19 infection in pregnancy in Libya.

This study describes the clinical management and the perinatal outcomes of twenty-one pregnant women treated for coronavirus disease (COVID-19) in Derna, Libya.

## **Methods**

A prospective case series was conducted to identify pregnant women who presented with symptom and sign of COVID- 19 and tested positive or highly suspected even if test was negative, from 15 June 2020 to 04 October 2021 at Al wahda hospital and outpatient clinic.

## Results

Twenty-one pregnant women with COVID-19 were admitted to hospital for inpatient management of COVID-19. Their mean age was  $35.23 \pm 3.6$  years. All women tested positive for COVID-19 by polymerase chain reaction test on nasopharyngeal swab and had chest radiographic findings consistent with COVID-19 pneumonia. Table 1,2,3,4 describes the clinical characteristics, laboratory finding, management, and outcomes of these women.

### Case 1

A 32 year old Libyan woman in her second pregnancy with history of spontaneous vaginal delivery, at 10 weeks pregnancy presented with fever, malaise, productive cough, PO<sub>2</sub> 95%, COVID-19 IgM positive, D Dimer 300, WBCs 7, lymphocytes 35%, chest X-ray with shield broncho pneumonia, home isolation, treated with IV Rocephin (ceftriaxone sodium) 1gm twice daily, azithromycin (Erythromycin) 500 mg once daily for three days, mucolyte (Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days.

Recovered after three weeks. Pregnancy passed uneventfully, and ended by spontaneous vaginal delivery at 38 weeks, male baby, weight 3.5 kg without any complications for mother or baby.

### Case 2

A 31 year old Libyan woman in her second pregnancy with history of twin delivered by caesarean section because of severe preeclampsia, at 35 weeks and 2 days presented with loss of smell and taste, generalized fatigue and malaise. Nasopharyngeal swab for COVID-19 was positive, HB 11 gm/dl, WBC  $10 \times 10^9$ , lymphocyte 45%, home isolation, receive azithromycin (Erythromycin) tab 500 mg once daily for three days, vit C tab 1 gm three times per day for two weeks, paracetamol tab 1gm three times per day for five days, improved after two weeks. Pregnancy ended at 38 weeks and 5 days, by urgent caesarean section due to abruption placenta, male baby, weight 3.5 kg without any complications for mother or baby.

### Case 3

A 38 year Libyan women in her seventh pregnancy, with history of previous 5 caesarean section and one abortion, at 34 weeks and 4 days presented with productive cough, breathlessness and fever, HB 9.5 gm/dl, WBC  $10 \times 10^9$ , lymphocyte 40%, D Dimer 500iu COVID-

19 IgG PCR positive, chest-X ray revealed bronchopneumonia, home isolation, treated with IV Rocephin(ceftriaxone sodium) 1gm twice daily, azthromycin tab 500 mg once daily for three days, mucolyte(Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days, vit D 25 000 iu once weekly . At 36 weeks presented with preterm labour, urgent caesarean section done under spinal anesthesia, to deliver alive female with birth weight 2.5 kg admitted to neonatal intensive care unit for 5 days due to respiratory distress syndrome.

#### Case 4

A 39 year old Libyan women in her eight pregnancy with history of six normal deliveries and one abortion, at 32 weeks and 2 days presented with acute pyelonephritis, blood group O positive, WBC  $4.9 \times 10^9$  HB 9.2 gms, platelet  $249 \times 10$ , FBS 118 mg/ ml, Na 140.1 mol/l, K 3.7 mol/l, CL 109.3 mol/l, BUN 8.4, creatinine 0.59, urea 18.9, HIV,HCV,HBSAg negative, admitted to antenatal ward treated by IV Rocephin(ceftriaxone sodium)1 gm every 12 hours for 5 days then continue on oral suprax 400 mg once daily for five days, IV fluids 3 liters every 24 hours and paracetamol infusion 1 gm every 8 hours, Dexamethasone intramuscular injection 12 mg once daily for two days. Pregnancy end at 36weeks and 4 days by vaginal delivery, alive female with birth weight 3.1 kg without any complications for mother or baby.

#### Case 5

A 33 year old Palestinian woman in her third pregnancy with history of two normal deliveries, at 21 weeks presented with generalized fatigue, arthralgia, fever, chills, loss of taste, productive cough, breathlessness and vomiting, on exam there was tachycardia, temperature  $38.5\text{ C}^\circ$ , axillary lymph node enlargement, chest was clear. Nasopharyngeal swab for COVID-19 was positive, WBC  $5 \times 10^9$ , lymphocytes 40%, HB 11 gm/dl, D Dimer 300 iu and home isolation. Treated with azthromycin tab (Erythromycin)500 mg once daily for three days, mucolyte(Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days, vit D 25 000 iu once weekly. Pregnancy ended by induced vaginal delivery due to postdate, alive male with birth weight 3.9 kg male physiological jaundice.

### Case 6

A 40 year old Libyan women in her first pregnancy, at 34 weeks and 2 days presented with cough, fever running nose and fatigue, PO2 97%. COVID-19 IgM positive and IgG negative, WBC  $7.6 \times 10^9$ , lymphocytes 70%, HB 9.4 gms/dl, platelets  $341 \times 10^3$ , D-Dimer 2.35 ng/ml, chest x ray normal. Home isolation, receive Azthromicin(Erythromycin) 500mg once daily for three days, paracetamol and vit C 1 gm three times per day for ten days, and tab zinc 200 mg twice weekly, Dexamethasone intramuscular injection 12 mg once daily for two days, at 36 weeks and 5 days, presented with preterm labour, urgent LSCS done under spinal anesthesia, due to elderly primi in labour, outcome was alive male birth weight 3.5 Kg without any complications for mother or baby.

### Case 7

A 39-year Libyan woman, in her eighth pregnancy with history of 5 vaginal delivery and two abortions, presented at 12 weeks with fever, productive cough, COVID-19 IgG positive WBC  $10 \times 10^9$ , lymphocytes 25%, HB 9 gm/dl. Home isolation, and treated with azthromycin(Erythromycin) tab 500 mg once daily for three days, mucolyte (Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days. Pregnancy ended by spontaneous vaginal delivery at 38 weeks, female baby, weight 3.6 kg without any complications for mother or baby.

### Case 8

A 30-year-old Libyan woman in her third pregnancy with history of one vaginal delivery and one first trimester abortion, her blood group A Rh negative, her husband blood group O Rh positive. Presented at 37 weeks +4 days with loss of taste and smell sensation, generalized fatigability, no history of fever nor cough, nasopharyngeal swab for, COVID-19 rapid test was positive, PO2 96%, WBC 9.4, lymphocyte 23%, HB 13.1 gm/dl, platelet 261, CRP 12 mg/dl, ESR 40, D Dimer 3700 lu. Home isolation for two weeks, and receive erythromycin(Erythromycin) tab 500 mg three times a day, enoxaparin(low molecular weight heparin) 0.4 mg once daily, paracetamol tab 1gm three times a day, vit c tab 1gm three times a day. Pregnancy ended by spontaneous vaginal delivery at 40 weeks +4 days, alive male, birth weight 2900 gm, APGAR score at first minute 7/10, at five minute 9/10, baby blood group A Rh positive and she receive anti D injection, without any complications for mother or baby.

### Case 9

A 35 year old Libyan woman, in her third pregnancy, with history of previous two caesarean section and gestational diabetes on diet control, at 36 weeks presented with fever, productive cough generalized malaise, chest exam bilateral reduced air entry, COVIDIgG positive, HB 10 gm/dl, WBC  $11 \times 10^9$ , lymphocyte 30%, home isolation, and treated with azithromycin (Erythromycin) tab 500 mg once daily for three days, mucolyte (Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days at 37 weeks and two days presented with labour, urgent caesarean section done under general anesthesia because of failed spinal anesthesia, alive male, birth weight 3.8 kg, admitted to neonatal intensive care unit for three days because of infant of diabetic mother.

### Case 10

A 32 year old Libyan woman, in her seventh pregnancy with history of four vaginal delivery and previous one caesarean section, presented at 11 weeks with fever, productive cough, COVIDIgG positive, HB 11 gm/dl, WBC  $10 \times 10^9$ , lymphocytes 30%, home isolation and treated by paracetamol tab 1 gm every 6 hours, Erythromycin (Erythromycin) tab 500 mg twice daily for 14 days, vit C tab 1 gm once daily for 14 days, Mucolyte tab three times a day for 14 days. At term spontaneous vaginal delivery female, birth weight 3.6 kg, without any complications for mother or baby.

### Case 11

A 28 year old Libyan woman in her first pregnancy, at 19 weeks and 2 days presented with vomiting, diarrhea, fever, chills and rigors with bilateral loin pain, HB 10.6 gm/dl, platelet  $293 \times 10^9$ , WBC 11.5, lymphocytes 35%, blood glucose 78 mg/dl, urea 15, BUN 7, creatinine 0.6, COVIDIgG positive, urine analysis shows pus cells of 45/ HPF with acetone and albumin, diagnosed as acute pyelonephritis, leave against medical advice and missed follow up.

### Case 12

A 42-year-old Libyan woman, in her second pregnancy, presented with dry cough, breathlessness, chest pain, at gestational age 37 weeks, with history of bronchial asthma but not on treatment, on examination there was tachycardia, tachypnea, fever, cyanosis, chest exam revealed reduced air entry bilateral. COVIDIgG positive, HB 11 gm/dl, WBC  $10 \times 10^9$  lymphocytes 30%, D Dimer 400 iu, diagnosed as pulmonary embolism, admitted to

antenatal ward and treated by heparin infusion, Rocephin(ceftriaxone sodium) 1 gm every 12 hours, gentamicine 80 mg every 8 hours, oxygen by mask. D Dimer progressively elevated. At 38 weeks spontaneous vaginal delivery, alive female with birth weight 3.4 kg, general condition deteriorated, died 20 hours after delivery.

#### Case 13

A 40 year old Libyan woman, in her sixth pregnancy with history of 4 vaginal delivery and previous one caesarean section, at 19 weeks presented with productive cough and fever, chest exam revealed reduced air entry bilaterally and rhonchi, PO<sub>2</sub> 99%, WBC  $6.4 \times 10^9$ , lymphocyte 30%, HB 13.1 gm/dl, platelet 201, CRP 12mg/dl, ESR 60, D Dimer 347.3 iu, admitted to antenatal ward and treated by azithromycin(Erythromycin) tab 500 mg once daily for three days, mucolyte(Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten, oxygen by mask. Delivered by caesarean section at 38 weeks because of fetal distress, alive female weight 3.4 kg, without any complications for mother or baby.

#### Case 14

A 35 year old Libyan woman, in her second pregnancy with history of previous caesarean section, presented at term with abruption placenta, urgent caesarean section done to deliver female, birth weight 2.6 kg. Second day postpartum presented with breathlessness, fever and productive cough, COVID IgG positive HB 9gm/dl, WBC  $10 \times 10^9$  lymphopenia, D Dimer 1300iu CRP 45. Leave hospital against medical advice.

#### Case 15

A 35 year old Libyan woman, In her seventh pregnancy with history of two caesarean section and four abortions, at 13 weeks gestation presented with left femoral deep venous thrombosis admitted to hospital for ten days, and receive heparin infusion and shift to warfarin tab 5 mg, at 24 weeks presented with fever, productive cough, breathlessness, cyanosis, tachycardia tachypnea, chest exam, revealed reduced air entry and bilateral crepitation, P<sub>O<sub>2</sub></sub> 80% admitted to isolation centre, O<sub>2</sub> 60l/min, HB 8.5gm/dl, WBC  $13 \times 10^9$ , lymphocytes 25%, D Dimer 3000iu. Rocephin(ceftriaxone sodium) intravenous 1 gm every 12 hours, meronem(carbapenemcarboxylic acide) 1 gm every 12 hours intravenous, Dexamethasone 4mg intravenous once daily, paracetamol infusion one gram every 8 hours, vit C one gram orally, zinc tab 20 mg once daily, azithromycin (Erythromycin) 500mg once daily for 14 days and Flagyl infusion 500 mg every 8 hours. After one week presented with

abdominal pain, obstetric ultrasound done, revealed single dead fetus with hydrops fetalis, placenta fundal and increased amniotic fluid, after one week, spontaneous delivery, dead female with hydrops, birth weight 1.2 kg. PO2 55% tachypnea, tachycardia, shift to isolation center, treated with CPAP, start to improve slowly after two weeks discharged home.

#### Case 16

A 41 year old Libyan woman in her fifth pregnancy with history of three vaginal delivery and one abortion, at 6 weeks and 4 days, presented with cough, fever, chills and rigors, running nose, loss of smell and taste and bone pain, nasopharyngeal swab for COVID-19 rapid test was positive, D Dimer 3341iu, WBC 5.1, lymphocytes 32%, HB 10.8 gm/dl, home isolation and treated by azithromycin (Erythromycin) tab 500 mg once daily for three days, mucolyte (Bromhexine HCl) tab three times a day for ten days, paracetamol and vit C tab one gram three times a day for ten days, after three weeks came for confinement, ultrasound scan revealed fetal death at 10 weeks gestation, induction of abortion medically and followed by evacuation and curettage.

#### Case 17

A 36 year old Libyan woman in her sixth pregnancy, with history of previous two caesarean delivery and three first trimester abortion, at 8 weeks and 6 days presented with fever, productive cough and generalized malaise, COVID-19 positive, WBC  $10 \times 10^9$  lymphocytes 30%, HB 9.8 gm/dl, platelet  $350 \times 10$ , D Dimer 380.1 mg/dl, home isolation and treated by paracetamol tab 1 gm every 4 hours, Azithromycin (Erythromycin) tab 500 mg once daily for 14 days, vit C tab 1 gm once daily for 14 days, mucolyte (Bromhexine HCl) tab three times a day for 14 days. At 11 weeks and 2 days presented with absence of pregnancy symptoms, ultrasound scan reveals single fetus with no heart pulsation crown rump length 9 weeks and 6 days, spontaneous abortion.

#### Case 18

A 36 year old Libyan woman in her fifth pregnancy, with history of previous four caesarean delivery, at 33 weeks and 3 days presented with fever, productive cough, breathlessness and generalized malaise, she has history of gestational thrombocytopenia, COVID-19 positive, WBCs  $4.4 \times 10^3$ , lymphopenia (14%), HB 10.3 gm/dl, platelet  $111 \times 10$ , D Dimer 900 iu then progressively elevated up to 10.9 mg/dl, CRP 21.8mg/dl, RBS 98mg/dl, she refuse to do chest X-ray. Advised for home isolation and she received paracetamol tab 1 gm every 4 hours, Azithromycin (Erythromycin) tab 500 mg once daily for 14 days, vit C tab 1 gm once

daily for 14 days, mucolyte (Bromhexine HCl) tab three times a day for 14 days, megavit 50 000 iu once weekly, Dexamethasone intramuscular injection 12 mg once daily for two days, Fraxiparin (low molecular weight heparin) 0.6 ml S/C once daily up to delivery and after delivery with D Dimer monitoring. At 38 weeks and 3 days elective caesarean section done, to deliver alive male with birth weight 3.4 kg Apgar score 8/10 in the first minute, 10/10 after five minutes, without any complications for mother or baby.

#### Case 19

A 37 year Algerian woman, in her fifth pregnancy, with history of previous two caesarean delivery and history of twins vaginal delivery and one first trimester abortion, at 30 weeks and 6 days presented with fever, productive cough, breathlessness, chest tightness and generalized malaise, COVID-19 positive, WBCs  $15 \times 10^3$ , lymphocyte (18%), HB 9.7 gm/dl, platelet  $230 \times 10$ , vit D 10, D Dimer 620 iu then progressively elevated up to 1120 iu, she refuse to do chest X-ray. Home isolation and she receive paracetamol tab 1 gm every 6 hours, azithromycin (Erythromycin) tab 500 mg three times a day for 14 days, vit C tab 1 gm twice daily for 14 days, tab mucolyte three times a day for 14 days, Megavit 50 000 iu once weekly, Dexamethasone intramuscular injection 12 mg once daily for two days, Fraxiparin (low molecular weight heparin) 0.6 ml S/C once daily up to delivery and after delivery with D Dimer monitoring. At 37 weeks and 2 days presented with labour pain at 2:00 AM, tense abdomen, FH positive on vaginal examination the cervix was fully dilated, emergency caesarean section done under general anesthesia, to deliver alive female, birth weight 3.3 kg APGAR score 9/10 in first minute, and 10/10 after five minute, without any maternal or neonatal complications.

#### Case 20

A 34 year old Libyan woman in her fourth pregnancy, with history of previous three caesarean delivery, at 30 weeks and 6 days presented with fever, productive cough, breathlessness, and generalized malaise, COVID-19 positive, WBCs  $10 \times 10^3$ , lymphocyte (8%), HB 9.8 gm/dl, platelet  $230 \times 10$ , vit D 10, D Dimer 1540 iu then progressively elevated up to 20.2 mg/dl, CRP 17, ESR 30, she refuses to do chest X-ray. Advise for home isolation and she receive paracetamol tab 1 gm every 4 hours, Azithromycin (Erythromycin) tab 500 mg once daily for 14 days, vit C tab 1 gm once daily for 14 days, mucolyte (Bromhexine HCl) tab three times a day for 14 days, megavit 50 000 iu once weekly, Dexamethasone intramuscular injection 12 mg once daily for two days, Fraxiparin (low molecular weight heparin) 0.6 ml sub

cutaneous injection once daily up to delivery and after delivery with D Dimer monitoring. At 38 weeks and 2 days elective caesarean section done, under general anesthesia, to deliver alive male with birth weight 3.750 kg APGAR score 8/10 in first minute, and 10/10 after five minute, without any maternal or neonatal complications.

### Case 21

A 32 year old Libyan woman in her third pregnancy, with history of two vaginal delivery and twin pregnancy, at 30 weeks and 4 days presented with fever, productive cough, breathlessness, left lower limb swelling and pain with redness, Doppler ultrasound shows left femoral vein thrombosis, COVID-19 positive, WBCs  $10 \times 10^3$ , lymphocyte (30%), HB 10.6 gm/dl, platelet  $230 \times 10^3$ , serum vitamin D 30 mg/dl, D Dimer 400iu. chest X-ray revealed left lung bronchopneumonia. Admitted to antenatal department and receive heparin infusion 1000 iu per hour for three days until APTT was double the control and Warfarin 8mg for three days then reduced to 5mg control by INR 2.4%, PO<sub>2</sub> 90% she receive O<sub>2</sub> by mask, and she receive paracetamol tab 1 gm every 4 hours, Azithromycin (Erythromycin) tab 500 mg once daily for 14 days, vit C tab 1 gm once daily for 14 days, mucolyte (Bromhexine HCl) tab three times a day for 14 days, Dexamethasone intramuscular injection 12 mg once daily for two days, then discharge after one week, for home isolation, shift to Fraxiparin (low molecular weight heparin) 0.6 ml S/C once daily at 35 weeks up to delivery and 6 weeks after delivery. At 37 weeks and 4 days end with spontaneous vaginal delivery of two female babies with Apgar score 9/10 in first min and 10/10 after five min for both and birth weight of 2.7 and 2.8 Kg without complication for mother or babies. Advised her to continue anticoagulant treatment for 12 weeks.

### Discussion

The risk of viral pneumonia is significantly higher among pregnant women compared with the general population, especially when there is no effective antiviral therapy(11). The influenza epidemic of 1918 and Asian flu epidemic of 1957 had a maternal mortality rate of 30% to 50%(12,13). SARS (severe acute respiratory syndrome) has the same impact, and pregnant women appear to have a worse clinical course with a case fatality rate of 25%. However, the crude fatality rate in older pregnant women is higher than the younger

one(6). In the current series, more pregnant women were home isolation, four required oxygen support and one required mechanical ventilation. Two women were severe cases, one woman was admitted to isolation center, twenty women were mild case, seven moderate and one died.

This poor outcome could be ascribed to the physiologic changes in pulmonary function during late pregnancy. The gravid uterus has been shown to elevate the diaphragm by up to 4cm in the third trimester, while oxygen consumption is increased by 20% in pregnancy and functional residual capacity is decreased, rendering the woman intolerant to hypoxia(14).

From our study, severe COVID-19 symptoms were seen more in older women and women with bronchial asthma. COVID-19 infections in older patients, with underlying medical conditions has a more rapid and severe progression, with worse prognosis, and high mortality rates(11). Hypertension was the most common comorbidity found in patients with COVID-19 where different than this study(12.)

In this study the most frequent COVID-19 symptoms reported were cough, fever, headache, nausea/vomiting, and fatigue, have been corroborated by other studies(13,14). In addition, nearly 50% of the patients were asymptomatic in Nigerian tertiary hospital (15).

Laboratory tests showed that absolute lymphocyte counts were reduced and D-dimer were increased and Hb were normal in most of the 21 pregnant patients. In our study, these patients showed a pattern of clinical characteristics similar to those reported in China study by Yu N et al.,(16).

However, most of the patients in our study were diagnosed in the third trimester. This was similarly the finding in Nigeria study(17). This finding may not be unconnected with the fact that physiological changes in pregnancy reduce tolerance to hypoxia, especially so in the third trimester(18).

Most of the pregnant women in this study were treated with analgesics and antibiotics however, few took Vitamin C, Vitamin D, Zinc/Magnesium. The use of analgesics was not unconnected with the fact that headaches, abdominal, joint and body pains were common presentations. Antibiotics reduce complications and mortality by preventing secondary bacterial infections and strengthening immune support treatment, hence their routine use in our pregnant women (15,16). It is recommended that empirical antibiotic regimens for patients with COVID-19 infection should follow local or/and national guidelines (19)

Antibiotics administered to patients in our study included Azthromicin follow by Rociphine,

Gentamicin, Meropepim and Flagyl. This was in line with the local protocol/antimicrobial sensitivity pattern.

The caesarean section may be performed during day 1 - 4 of the illness as they may progress to the critical phase around day 5 - 7 of illness, as observed in many symptomatic COVID-19 patients. The importance of having the delivery in a planned and controlled environment should be emphasized as this allows all healthcare workers involved to be ready and allow adequate time for them to don the PPE appropriately.

Even though eight of the women in our study had caesarean delivery, **all the caesareans were based on medical reasons**, one case abruption placenta and all of others obstetric indications and not due to COVID-19 infection itself and most of pregnant women had ended with vaginal delivery. Vaginal delivery in pregnant women with COVID-19 is safe, and has not been found to increase rates of neonatal COVID-19 infection, neonatal or maternal deaths (20). Choice of route of delivery should be individualized, and based on obstetric indications with regard to the woman's preference (18,20).

However, from our study findings, COVID-19 infection in pregnancy was associated with adverse perinatal and maternal outcomes. Preterm delivery/birth, the most common maternal/perinatal complication of COVID-19 infection in pregnancy reported in our study, may be a secondary complication of respiratory disease or directly induced by the viral infection (15). COVID-19 can cause prelabour rupture of fetal membranes in the third trimester, leading to preterm labour (16). Zhu et al., also postulated that **maternal hypoxia caused by COVID-19 can precipitate in premature labour (21)**.

**Six infection cases were diagnosis on first trimester**, 3 cases continue pregnancy up to term ended by spontaneous vaginal delivery, 2 cases ended by missed abortion medical termination of pregnancy and followed by evacuation and curettage and 1 case ended at 26 weeks intra uterine fetal death (Non immune hydrops fetalis, spontaneous delivery). **Three infection cases was diagnosis on second trimester**, 2 cases complete up to term (**one case had an induced vaginal delivery because of postdate complicated by neonatal jaundice, admitted to neonatal intensive care unit for ten days then discharged. And another ended at term by emergency caesarean section because of fetal distress and 1 case missed her follow up**). And twelve **infection cases were diagnosis on third trimester**, 9 ended at term and 3 preterm.

## Conclusion

Management of pregnant women with severe COVID-19 is challenging and requires comprehensive skills. Avoiding early birth may be a safer option. We recommend an individualized approach to treatment, which includes carefully weighing the risks and advantages of expectant obstetric management versus delivery.

### Ethical Approval:

As per international standard or university standards written ethical approval has been collected and preserved by the author(s).

### Consent

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

**Table 1: Clinical characteristics of the 21 pregnant women with COVID 19 infection**

	Age	Gestational age at diagnosis	Gestational age at delivery	Clinical presentation	Medical comorbidity
Case 1	32	10	38	Fever, malaise, productive cough	None
Case 2	31	35+2	38+5	malaise, fatigue, loss of smell & taste	Sever pre-eclampsia
Case 3	38	34+4	36	Fever, productive cough & breathlessness	None
Case 4	39	32+2	36+4	Pylonephritis	Pylonephritis
Case 5	33	21	41	Fever, chills fatigue, arthralgia, loss of taste & productive cough	None
Case 6	40	34+2	36+5	Fever, running nose & cough	None
Case 7	39	12	38	Fever, productive cough	None
Case 8	30	37+4	40+4	Fatigue, loss of smell	None
Case 9	35	36	37	Fever, malaise & productive cough	Gestational DM
Case 10	32	11	40	Fever & productive cough	None
Case 11	28	19+2	Missed	Fever, chills, rigors, vomiting, diarrhea & loin pain	None
Case	42	37	38	Dry cough, breathlessness & chest	Bronchial asthma

12				pain	
Case 13	40	19	38	Fever & productive cough	None
Case 14	35	40	40	Fever, breathlessness & productive cough	None
Case 15	35	24	26	Lt femoral DVT	None
Case 16	36	6+4	10	Fever, chills, rigor, cough, running nose, loss of smell and taste, bone pain	None
Case 17	36	8+6	11+2	Fever, cough & malaise	None
Case 18	36	33+3	38+3	Fever, cough, malaise & breathlessness	Gestational thrombocytopenia
Case 19	37	30+6	37+2	Fever, cough, malaise, chest pain & breathlessness	None
Case 20	34	30+6	38+2	Fever, cough, malaise, breathlessness	None
Case 21	32	30+4	35	Fever, cough, malaise, breathlessness & femoral DVT	None

**Table 2: Laboratory results of the 21 pregnant women with COVID 19 infection**

	Place of care	Laboratory investigations			
		WBC x10 <sup>9</sup>	HBgm/dl	Lymphocytes %	D Dimer Iu/ml
Case 1	Home	7	9.5	35	300
Case 2	Hospital	10	11	45	
Case 3	Home	10	9.5	40	500
Case 4	Hospital	4.9	9.2	-	-
Case 5	Home	10	11	40	300
Case 6	Home	7.5	9.4	70	2340
Case 7	Home	10	9.8	30	380.1
Case 8	Home	9.4	13.1	23	3700
Case 9	Home	11	10	30	-
Case 10	Home	10	11	30	-

Case 11	Missed	11.5	10.5	35	-
Case 12	Hospital	10	11	30	400
Case 13	Hospital	6.4	13.1	30	347.3
Case 14	Hospital	10	9	30	1300
Case 15	Isolation center	13	8.5	25	3000
Case 16	Home	5.1	10.8	32	334
Case 17	Home	10	9.8	30	380.1
Case 18	Home	4.4	10.3	114	900
Case 19	Home	15	9.7	18	1120
Case 20	Home	10	9.8	8	1540
Case 21	Hospital	10	10.6	30	400

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**Table 3: Maternal Treatment during COVID-19 infection in pregnancy**

	Treatment						
	O2 Therapy	Antibiotics & antiviral	Paracetamol	Corticosteroids Dexamethasone	Vit D	Heparin	Others
Case 1	No	Rociphin, Azthromicin	yes	No	No	No	Mucolyte tab Vit C
Case 2	No	Azthromicin	Yes	No	No	No	Vit C
Case 3	No	Rociphin, Azthromicin	Yes	No	Yes	No	Mucolyte tab Vit C
Case 4	No	Rociphin	Yes	Yes	No	No	No
Case 5	No	Azthromicin	Yes	No	Yes	No	Mucolyte tab Vit C
Case 6	No	Azthromicin	Yes	Yes	No	No	Vit C, zinc
Case 7	No	Azthromicin	Yes	No	No	No	Mucolyte tab Vit C
Case 8	No	Azthromicin	Yes	No	No	Yes	Vit C
Case 9	No	Azthromicin	Yes	No	No	No	Mucolyte tab Vit C
Case 10	No	Erythromycin	Yes	No	No	No	Mucolyte tab Vit C
Case 11	-	-	-	-	-	-	-
Case 12	Yes	Rociphin, Gentamicin	-	-	-	Yes	-
Case 13	Yes	Azthromicin	Yes	No	No	No	Mucolyte tab Vit C
Case 14	-	-	-	-	-	-	-
Case 15	Yes	Rociphin, Meronem Flagyl, Erythromycin	yes	Yes	No	No	Vit C, Zinc tab
Case 16	No	Azthromicin	Yes	No	No	No	Mucolyte tab Vit C
Case 17	No	Azthromicin	Yes	No	No	No	Mucolyte tab Vit C

Case 18	No	Azthromicin	Yes	Yes	Yes	Yes	Mucolyte tab Vit C
Case 19	No	Azthromicin	Yes	Yes	Yes	Yes	Mucolyte tab Vit C
Case 20	No	Azthromicin	Yes	Yes	Yes	Yes	Mucolyte tab Vit C
Case 21	Yes	Azthromicin	yes	yes	No	Yes	Mucolyte tab Vit C

UNDER PEER REVIEW

**Table 4: Maternal and neonatal outcome**

	Severity of disease	Outcome				
		Maternal	Mode of delivery	Baby weight/kg	Baby sex	Fetal and neonatal outcome
Case 1	Mild	Living	Vaginal delivery	3.5	Male	Living, go home
Case 2	Mild	Living	Urgent C/S –abruptio placenta	3.5	Male	Living, go home
Case 3	Mild	Living	Urgent C/S – P5 C/S in labour	2.5	Female	Living, special care baby unit for 5 days due to RDS
Case 4	Moderate	Living	Vaginal delivery	3.1	Female	Living go home
Case 5	Mild	Living	Vaginal delivery	3.9	Male	Living, go home, physiological jaundice
Case 6	Mild	Living	Urgent C/S-elderly primi in labour	3.5	Male	Living, go home
Case 7	Mild	Living	Vaginal delivery	3.6	Female	Living, go home
Case 8	Mild	Living	Vaginal delivery	2.9	Male	Living, go home
Case 9	Moderate	Living	Urgent C/S – P2C/S in labour	3.8	Male	Living, special care baby unit for 3days due to IDM
Case 10	Mild	Living	Vaginal delivery	3.6	Female	Living, go home
Case 11	Mild	Miss follow up				
Case 12	Sever	Dead (pulmonary embolism)	Vaginal delivery	3.4	Female	Living, go home
Case 13	Moderate	Living	Urgent C/S- fetal distress	3.4	Female	Living, go home
Case 14	Moderate	Living	Urgent C/S- abruption placenta	2.6	Female	Living, go home
Case 15	Sever	Living	Vaginal delivery	1.2	Female	IUFD –hydrops fetalis
Case 16	Mild	Living	Induced abortion	-	-	Missed 10 weeks
Case 17	Mild	Living	Induced abortion	-	-	Missed 9 weeks
Case 18	Moderate	Living	Elective C/S P4 C/S	3.4	Male	Living, go home
Case 19	Moderate	Living	Urgent C/S – P2C/S in labour	3.3	Female	Living, go home
Case 20	Moderate	Living	Elective C/S P3C/S	3.750	Male	Living, go home
Case 21	Moderate	Living	Vaginal delivery	2.8	Male	Living, go home

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