Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 8, Issue 1, pp: (230-244), Month: January - April 2021, Available at: www.noveltyjournals.com

Effect of Corona Virus (2) Infection on Pregnancy Outcomes

Eman A. Soliman El-Hosary

Assistant Professor in Maternal and Newborn Health Nursing Department, Faculty of Nursing, Menoufia University, Egypt.

Abstract: **Background: Coronavirus-2 infection is a global health emergency problem. The association between covid-19 and pregnancy outcomes still unclear.**

Objectives: To assess the pregnancy outcomes, and vertical transmission potential among pregnant women with coronavirus-2 infection.

Study Design: Descriptive retrospective review for (200) pregnant women from (2) hospitals in Egypt between May 25, 2020 and November 28, 2020. Evidence of vertical transmission was assessed by presence of the corona virus-2 infection in the amniotic fluid and cord blood, and neonatal pharyngeal swab samples.

Results: 95% of Covid pregnant women had gestational age of less than 40 weeks at delivery, while 92.5% had gestational age more than 37 weeks among none Covid women. In 66% of cases, women reported a history of relevant environmental exposure, and 34% had contact with infected persons. There were 46.7% had gestational diabetes, 15.8% had preeclampsia, and 29.2% had abortion among Covid pregnant women. While, 43.7% had gestational diabetes, 38.7 % had abortion, and 3.8% had preeclampsia among none Covid pregnant women. There were no cases of maternal deaths among two groups. There were 95% of the cases of the two groups had normal APGAR score and 2.5% of the cases of the two groups transferred to the neonatal intensive care unit. All cases had negative neonatal pharyngeal swap for Corona virus (2).

Conclusions: Corona virus (2) infection was associated with increased risk of gestational diabetes, preeclampsia, premature rupture of membrane, and spontaneous preterm birth. There was no evidence of vertical transmission of covid-19 to the fetus during pregnancy.

Keywords: Covid-19, pandemic, corona virus 2, pregnancy outcomes, pneumonia, neonatal outcomes, spontaneous preterm labor, gestational diabetes, preeclampsia, vertical transmission, pharyngeal swap.

I. INTRODUCTION

The coronavirus- 2 infection 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus- 2 infection (SARS-CoV-2), and has now become a global pandemic rapidly growing across the world ***[1]***. It is a health emergency situation. Since the first case of COVID-19 pneumonia was reported in Wuhan, Hubei Province, China, in December 2019, the infection has spread quickly to the rest of China and beyond to all the world ***[2-3]***. Severe acute respiratory syndrome coronavirus- 2 belongs to the same b-coronavirus subgroup, and it has genome similarity of about 80% and 50% with SARS-CoV and MERS-CoV, respectively ***[4]***. On March, 2020, World Health Organization (WHO) estimated the global mortality rate of the coronavirus-2 infection to be 3.4% ***[5]***.

It has become critical to identify high risk individuals for COVID-19 during pregnancy to avoid negative outcomes through early, aggressive, and preventive management ***[6]***. Although Corona virus (2) infection can affect anyone, pregnant women may be more susceptible to this viral infection due to physiological and immunological changes that occur during pregnancy ***[7]***. Pregnant women are especially susceptible to severe pneumonia and respiratory pathogens,

because of the physiological changes in the cardiopulmonary and immune systems such as diaphragm elevation, increased oxygen consumption, reduced functional residual volumes and edema of the respiratory tract mucosa, which can render them intolerant to hypoxia and increased susceptibility to viral infections and can have negative outcomes ***[8,9,10,11]***.

One of the major consequences of viral pneumonia is deaths during pregnancy worldwide ***[12]***. Moreover, viral infections have been associated with negative pregnancy and neonatal outcomes ***[13]***. Therefore, there is a concern of having worsen pregnancy outcomes due to intrauterine transmission of infection to the fetus from the mother ***[14,15]***. Studies have shown the impact of viral infections on spontaneous abortion, preterm labor and related outcomes ***[16]***. However, the current burden of the negative pregnancy events including preterm birth and low birth weight is unclear among women infected with coronavirus-2 infection particularly in comparison with pregnant women without infection.

However, to date, there are limited studies pertaining to the outcomes of coronavirus-2 infection during pregnancy, differences in clinical criteria, and the potential risks to the vertical transmission to the fetus, and the potential risks to the fetus and newborn. Studies have so far shown that the clinical, radiological, and laboratory characteristics of coronavirus-2 pneumonia in the pregnant women are similar to those reported for non-pregnant patients ***[17-18]***. Moreover, currently there has been no evidence of intrauterine vertical transmission of coronavirus-2 infection in the pregnant women with coronavirus-2 infection ***[19-20]***.

To facilitate the understanding of covid-19 in pregnancy, we carried out a retrospective observational study to compare the clinical courses and outcomes of pregnant women with covid-19 and pregnant women without covid-19, and also summarized the neonatal outcomes, including the vertical transmission potential to covid-19. So, the researcher is interesting in studying the impact of covid-19 on pregnancy outcomes.

Purpose of the Study: To investigate the effect of coronavirous-2 on pregnancy outcomes, and estimate the potential for vertical transmission among Covid pregnant women.

Research Questions:

- ✓ What are the clinical characteristics of Covid-19 during pregnancy ?
- ✓ What are the adverse obstetric outcomes during pregnancy?
- ✓ What are the adverse neonatal effects of Covid-19 during pregnancy?
- ✓ Is coronavirous-2 infection transmitted from the mother to the fetus during pregnancy?

II. SUBJECTS AND METHODS

Research Design:

Descriptive comparative study. Descriptive study design is a type of observational study design. In this study, the researcher formulate research questions about possible associations between an outcome and an exposure and to further investigate the potential relationships. The descriptive comparative cohort study compares groups of individuals who are alike in many ways but differ by a certain characteristics such as pregnant women infected with Covid-19 and women without Covid-19.

Settings:

The present study conducted in the delivery unit at two hospitals in Menoufia Governorate; University hospital and Teaching hospital in Shebin-Alkom. These are very big hospitals and presented quarantine for Covid pregnant women.

Sample and Sampling Technique:

A convenient sample of (200) pregnant women. The researcher divided the women into two groups: Group (1) including the pregnant women with Covid-19. Group (2) included normal pregnant women without Covid-19 , the inclusion criteria included: no history of obstetrical and neonatal complications, and agree to participate in this study. While the exclusion criteria women who refuse to participate in the study.

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 8, Issue 1, pp: (230-244), Month: January - April 2021, Available at: www.noveltyjournals.com

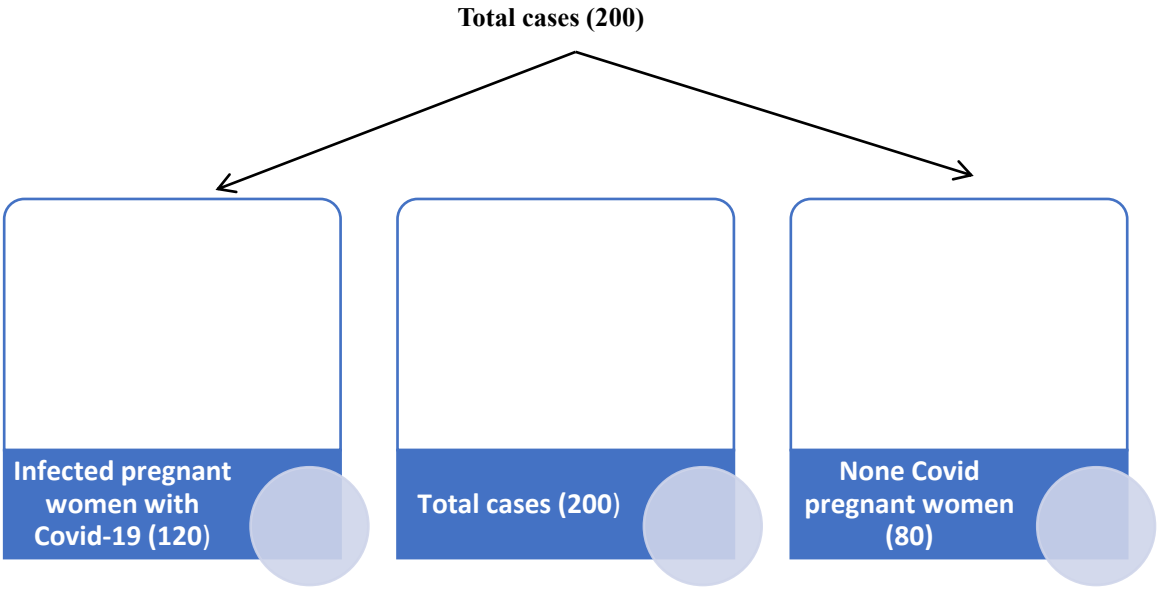
The sample size: The sample size was calculated using the following equation Ambe et al (2010). ***[21]***

$$n = \frac{(Z^2 p \times q)}{e^2}$$

- n = sample size
- z = z value for 99%. = 2.57
- p (prevalence) = 0.5
- q = (1-p) = (1-0,50)
- e = margin of error= 0.10

$$n = (2.57)^2 \times 0.50 \times (1-0.50) \div (0.10)^2 = 165$$

The researcher added (35) cases (20% of sample size) to the total sample size to overcome any withdrawn cases during collection of data, and to complete the total cases to be two hundred pregnant women. The researcher found that 120 cases of the women were pregnant women infected with Covid-19, so the research subtracted the total number of the cases with the number of Covid pregnant women to become 80 cases for none Covid pregnant women.



Instruments of Data Collection:

The researcher used three instruments for data collection after a review of the past and current literature. It distributed by Google form and used to collect the data by the researcher as the following:

Instrument(1) Self structured interviewing questionnaire: This instrument was developed and used by the researcher after extensive literature review and it included four parts:

Part one **Demographic characteristics**: Personal characteristics of the studied women. Which include age, educational level, occupational type for women and her husband, and site of residence.

Part two **Reproductive history:** History of the previous pregnancies and deliveries of the women. It included, gravida, para, gestational age, history of abortion, causes of abortion, past history of any obstetrical complications such as placenta previa and placenta abruption, gestational diabetes, and preeclampsia.

Part three **The women's clinical characteristics:** which included the signs and symptoms of the pregnant women with covid-19 infection such as fever, cough, fatigue, sore throat, shortness of breath, and dyspnea. It included also the Laboratory and radiologic findings of the pregnant women with coronavirus-2 disease on admission, the severity of the disease and treatment. Data extracted from the patient records included time from the onset of symptoms to hospital admission, the severity of COVID-19, comorbidities, symptoms at onset, vital signs on admission, laboratory tests, computed tomography findings(CT), treatments such as (antivirus regimens, antibiotics, corticosteroids, gamma globulin), and length of hospital stay (LOS).

Part four **Maternal outcomes:** It is divided into three sub-parts: first; about antenatal complications during pregnancy such as abortion, gestational diabetes, anemia, preeclampsia, pregnancy induced hypertension, and antepartum hemorrhage. Second; about obstetrical complications during labor such as preterm and post-term labor, prolonged and obstructed labor, PROM, vaginal bleeding, fetal& maternal distress, failure of to progress during labor, still birth. It included also mode of delivery and indications for cesarean section. Third section included postpartum complications such as postpartum hemorrhage, subinvolution of the uterus, and perineal laceration, maternal death. It included also the neonatal complications after delivery such as preterm baby, small for gestational age, neonatal asphyxia, neonatal intensive care unit admission (NICA), and neonatal death (ND).

Instrument (2) ABGAR scale: The Apgar score is a grate method to quickly summarize the health status of the newborn against infant morbidity and mortality. ***[22]*** It is developed by Virginia Apgar, an anesthesiologist at New York–Presbyterian Hospital, in (1952) to quantify the effects of obstetric anesthesia on the newborn babies. The Apgar score is determined by evaluating the newborn baby on five simple criteria on a scale from (0 to 2), then summing up the five values thus obtained. The resulting score ranges from (0 to 10). The five criteria are summarized using words chosen to form a backronym APGAR (Appearance, Pulse, Grimace, Activity, Respiration) ***[23]***. (7-10) considered normal, (4-6) considered mild asphyxia, (0-3) considered severe asphyxia.

Instrument (3) Neonatal clinical profile: Which included two parts; part one included the biophysical measurements of the newborn such as weight and height, head and chest circumference, and APGAR score in the first and fifth minutes after delivery. Part two included the laryngeal or throat swap analysis results. The neonates were tested for infection with Corona virus(2). Viral clearance was confirmed by serial (RT-PCR), using samples from laryngeal swab, with at least two consecutive negative results taken 24 hours apart considered cleared.

Reliability and validity of the instruments: The reliability of the instrument was conducted to investigate the instrument internal consistency which used in the study. Internal consistency describes the extent to which all the questionnaire items measure the same concept or construct. Cronbach alpha coefficients were calculated to examine the measurement reliability with multipoint items. The accepted values of Cronbach alpha coefficient range from 0.60 to 0.95. [Sun et al(2007), Tavakol, and Dennick (2011) ***[24,25]***. The questionnaire items of the present study were proven reliable where $\alpha = (0.91)$. Instruments were reviewed by four experts in the field of maternity health nursing and pediatric nursing (Two pediatric nursing experts and two maternity health nursing)

Ethical consideration: An official permission to carry out the study was obtained from the director of each setting after submitting an official letter from the Dean of the Nursing College - Menoufia University and Vice Dean for post graduates studies and researches explaining the purposes of the study and methods of data collection. Written informed consent was obtained from the pregnant women who agreed to the testing of biological samples and neonatal pharyngeal swab samples.

Data Collection: We obtained the medical records and compiled clinical and outcome data for consecutive pregnant women from (2) hospitals between May 25, 2020 and November 28, 2020. Complete epidemiologic history, clinical symptoms and signs, laboratory and radiologic findings, treatment measures, and outcome data were extracted from electronic medical records by the researcher. Laboratory assessments consisted of complete blood cell count, liver and renal function, electrolytes, C-reactive protein, and coagulation testing. We determined the presence of a radiologic abnormality based on the documentation or description in the medical charts.

The date of onset of the disease was defined as the day when the symptoms were noticed. The intervals from onset of the disease to the hospital admission and delivery were recorded. Data on pregnancy and neonatal outcome, including

gestational age at delivery, mode of delivery, indications for cesarean delivery, complications, neonatal birth weight, Apgar scores, and neonatal intensive care unit (NICU) admission, were collected.

Sample collection: Amniotic fluid samples from women with COVID-19 pneumonia were obtained through direct needle syringe aspiration at the time of cesarean delivery. Cord blood and neonatal pharyngeal swab samples were collected immediately after delivery in the operating or delivery room. Sample for breast milk were also obtained to test the presence of the virus in the breast milk of Covid pregnant women after delivery. Evidence of vertical transmission was evaluated by testing for the presence of SARS-CoV-2 in these clinical samples, with at least two consecutive positive results taken (24) hours apart considered cleared.

Statistical Analysis: All statistical analyses were done using SPSS version 22. Initially, the internal consistency coefficients were examined to ensure the reliability of the used instrument for the present samples. Frequencies, means, and standard deviations were calculated to describe the sample. chi-square test (X^2) was used to compare the Covid and non Covid pregnant women regarding to the maternal and neonatal outcomes. Statistical significance was considered at p-value <0.05.

III. RESULTS

Table (1): Showed the demographic and reproductive characteristic of the studied sample, which the range of age was 24 and 25 years among Covid and none Covid pregnant women respectively. 95% had gestational age of less than 40 weeks at delivery among Covid women, while 92.5% had gestational age more than 37 weeks among none Covid women. 38% and 35% delivered by cesarean section among Covid and none Covid pregnant women respectively. The main indication for C.S was previous C.S which represented 34.8% and 47% among Covid and none Covid pregnant women respectively.

Table (2): Illustrated the clinical characteristics and outcomes among Covid Pregnant Women. In 66% of cases, women reported a history of relevant environmental exposure, and 34% had contact with infected persons. The most common symptoms at presentation were fever in 49% , cough in 12.5% , and fatigue in 11%, while 4.2% has not any signs or symptoms of the disease which were clinically diagnosed with Covid-19 pneumonia. Elevated levels of C-reactive protein were found in 44% of the women. In cases that underwent chest CT scans at the time of admission, 13% revealed abnormal results. There were 5% of the pregnant women with severe pneumonia and required ICU admission. A total of 67% cases had been discharged from the hospitals. There were no cases of maternal death. All cases had negative results for neonatal pharyngeal swap and breast milk swap for Covid-19 virus infection among Covid pregnant women.

Table (3): Clarified the maternal and neonatal outcomes among pregnant women, there were 46.7 % had gestational diabetes, 15.8% had preeclampsia, and 29.2% had abortion among Covid pregnant women. While, 43.7% had gestational diabetes, 38.7 % had abortion, and 3.8% had preeclampsia among none Covid pregnant women. There were 47.5% and 5% of cases had preterm premature rupture of membrane among Covid and none Covid pregnant women respectively, while 30% and 2.5% of the cases had preterm labor among Covid and none Covid pregnant women respectively. 33.3% of the cases had hospital stay more than 72 hours among Covid pregnant women. There were 8.3% and 10% had postpartum hemorrhage among Covid and none Covid pregnant women respectively, while 4.2% and 5% of the cases had perineal laceration among Covid and none Covid pregnant women respectively. There were no cases of maternal and neonatal death among two groups. There were 95% of the cases of the two groups had normal APGAR score and 2.5% of the cases of the two groups transferred to the neonatal intensive care unit.

Figure (1): Showed the distribution of the studied sample according to the indications of the cesarean section. The main indication for C.S was previous C.S which represented 34.8% and 47% among Covid and noncovid pregnant women respectively. 17.4% because of covid-19 in the Covid pregnant women group. Fetal distress represented 10.8% and 7% among Covid and noncovid pregnant women respectively. Failure to progress represented 13% and 14% among Covid and noncovid pregnant women respectively.

Figure (2): Estimated the distribution of the Covid pregnant women according to the symptoms of the disease. The most common symptoms at presentation were fever in 49% , cough in 12.5% , fatigue in 11%, sore throat in 8%, and shortness of breath in 7% of Covid pregnant women.

Figure (3): Presented the distribution of the studied sample according to the pregnancy outcomes, there were 46.7 % had gestational diabetes, 15.8% had preeclampsia, and 29.2% had abortion among Covid-19 pregnant women. While, 43.7% had gestational diabetes, 38.7 % had abortion, and 3.8% had preeclampsia among none Covid pregnant women. There were 47.5% and 5% of the cases had preterm premature rupture of membrane(PPROM) among Covid and none Covid pregnant women respectively, while 30% and 2.5% of the cases had preterm labor among Covid and none Covid pregnant women respectively. There were the same percentage (95%) of the cases of the two groups had normal APGAR score among their neonates.

Table (1): Demographic and reproductive characteristics of the pregnant women (200)

Characteristics	Covid Women (120)		None Covid Women (80)		X^2	P
	No.	%	No.	%		
Age (Years)						
▪ Mean- SD	**30.7- 3.7**		**30.8 - 3.8**		**0.9**	**0. 19**
▪ Range	**24**		**25**			
Gestational age on admission (weeks)	**36.8**		**39.0**		**0.19**	**0.07**
▪ Median	**28**		**33**			
▪ Range						
Gestational age at delivery (weeks)	**38.6**		**40.0**			
▪ Median	**31**		**36**			
▪ Range	**2 (1.7)**		**0.0 (0.0)**		**26.02**	**0.000***
○ < 34 (n%)	**36 (30)**		**2 (2.5)**			
○ 34-36 (n%)	**78 (65)**		**4 (5)**			
○ 37 (n%)	**4 (3.3)**		**74 (92.5)**			
○ > 37 (n%)						
Parity						
▪ 1-3	**87**	**73**	**52**	**65**		
▪ 4-5	**23**	**19**	**22**	**27.5**	**0.09**	**0.9**
▪ > 5	**10**	**8**	**6**	**7.5**		
Mode of delivery						
▪ Vaginal	**74**	**62**	**52**	**65**	**1.19**	**0.5**
▪ C.S	**46**	**38**	**28**	**35**		
Indications of C.S						
▪ Covid-19	**8**	**17.4**	**0.0**	**0.0**		
▪ Previous c.s	**16**	**34.8**	**13**	**47**		
▪ Fetal distress	**5**	**10.8**	**2**	**7**		
▪ Failure to progress	**6**	**13**	**4**	**14**	**7.38**	**0.1**
▪ Placental previa	**3**	**6.6**	**4**	**14**		
▪ Preeclampsia	**6**	**13**	**3**	**11**		
▪ Abnormal fetal growth	**2**	**4.4**	**2**	**7**		
Total	**120**	**100**	**80**	**100**		

***** Highly statistically significant at p< 0.00; SD: standard deviation; C.S: cesarean section.

International Journal of Novel Research in Healthcare and Nursing
Vol. 8, Issue 1, pp: (230-244), Month: January - April 2021, Available at: www.noveltyjournals.com

Table (2): Clinical Characteristics and Outcomes of Covid Pregnant Women(n=120)

Clinical Characteristics	N	%
Epidemiological History		
▪ Relevant environmental exposure	**79**	**66**
▪ Contact with infected person	**41**	**34**
Symptoms		
▪ Fever	**59**	**49**
▪ Cough	**15**	**12.5**
▪ Fatigue	**13**	**11**
▪ Shortness of breath	**8**	**7**
▪ Sore throat	**10**	**8**
▪ Myalgia	**6**	**5**
▪ Dyspnea	**3**	**2.5**
▪ Diarrhea	**1**	**0.8**
▪ No symptoms	**5**	**4.2**
Disease severity		
▪ Severe	**6**	**5**
▪ None severe	**114**	**95**
Laboratory and radiologic findings		
○ **C-reactive protein concentration**		
▪ Increased	**53**	**44**
▪ Normal	**67**	**56**
○ **CT chest findings**		
▪ Patchy shadowing or ground-glass opacity	**16**	**13**
▪ Negative findings	**104**	**87**
Treatment		
▪ Antibiotic therapy	**99**	**82.5**
▪ Antiviral therapy	**9**	**7.5**
▪ Use of corticosteroid	**6**	**5**
▪ ICU admission	**6**	**5**
Clinical outcomes		
▪ Remained in hospital	**40**	**33**
▪ Discharged	**80**	**67**
▪ Died	**0**	**0**
Neonatal Pharyngeal Swap Outcomes		
▪ Negative	**120**	**100**
▪ Positive	**0**	**0**
Breast Milk Swap Outcomes		
▪ Negative	**120**	**100**
▪ Positive	**0**	**0**
Total	**120**	**100**

CT: computed tomography; ICU: intensive care unit

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 8, Issue 1, pp: (230-244), Month: January - April 2021, Available at: www.noveltyjournals.com

Table (3): Maternal and Neonatal Outcomes among Pregnant Women (n=200)

Outcomes	Covid Women (n=120)		None Covid Women (n=80)		X^2	P-value
	N	%	N	%		
Antenatal Outcomes:						
o Abortion	35	29.2	31	38.7		
o Gestational diabetes	56	46.7	35	43.7		
o Preeclampsia	19	15.8	3	3.8	**6.38**	**0.01***
o Hypertensive Disorders	4	3.3	5	6.3		
o Placenta previa	4	3.3	4	5		
o Oligohydramnois	2	1.7	2	2.5		
Natal Outcomes:						
o Preterm labor						
▪ Preterm delivery before 34 wk.	2	1.7	0	0		
▪ Preterm delivery before 37 wk.	36	30	2	2.5	**11.4**	**0.02***
o PPROM	57	47.5	4	5		
o Fetal distress	9	7.5	2	2.5		
o LBW	2	1.7	2	2.5		
o Still birth	5	4.1	4	5		
o Failure to progress	9	7.5	2	2.5		
o Normal	0	0	64	80		
Postnatal Outcomes:						
o PPH	10	8.3	8	10		
o Perineal laceration	5	4.2	4	5	**0.09**	**0.7**
o Hospital stay more than 72 hours	40	33.3	0	0		
o Normal	65	54.2	68	85		
o Maternal death	0	0	0	0		
Neonatal Outcomes						
o Severe neonatal asphyxia	3	2.5	2	2.5	**0.35**	**0.5**
o Transferred to NICU	3	2.5	2	2.5		
o Normal APGAR score	114	95	76	95		
o Neonatal death	0	0	0	0		
Total	**120**	**100**	**80**	**100**		

***** Statistically significant at p< 0.05, WK: weeks; PPROM: preterm premature rupture of membranes; LBW: low birth weight; PPH: postpartum hemorrhage; NICU: neonatal intensive care unit.

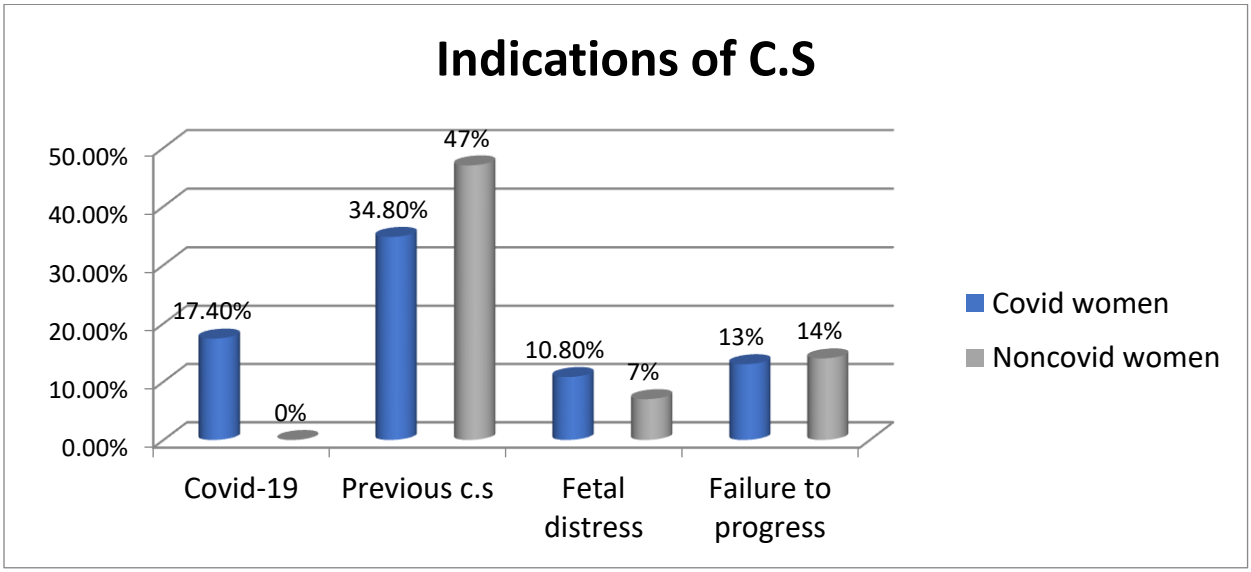


Figure (1) distribution of the studied sample according to the indications of the cesarean section

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 8, Issue 1, pp: (230-244), Month: January - April 2021, Available at: www.noveltyjournals.com

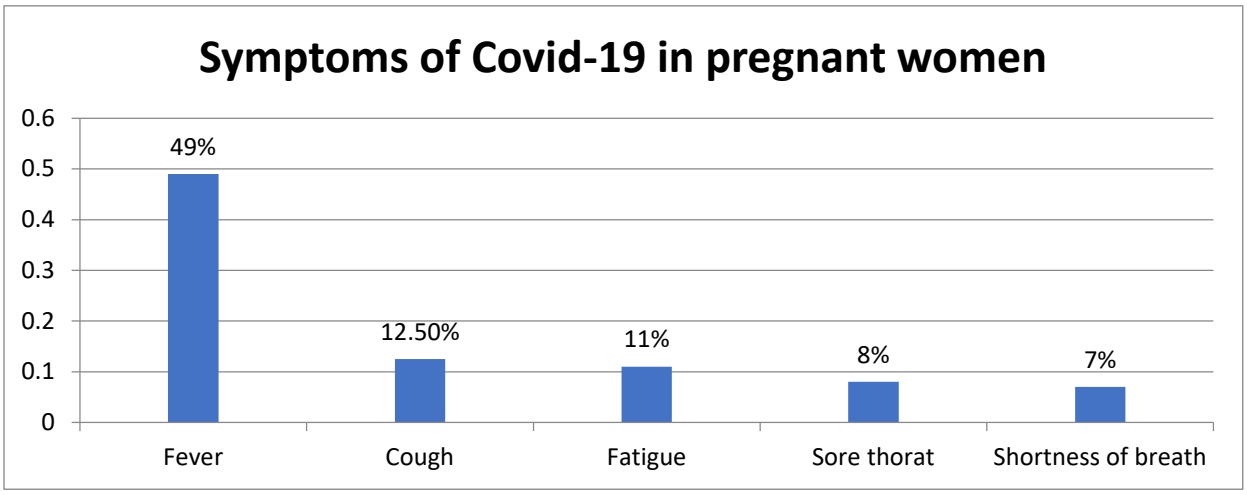


Figure (2): Distribution of the Covid pregnant women according to the symptoms of the disease.

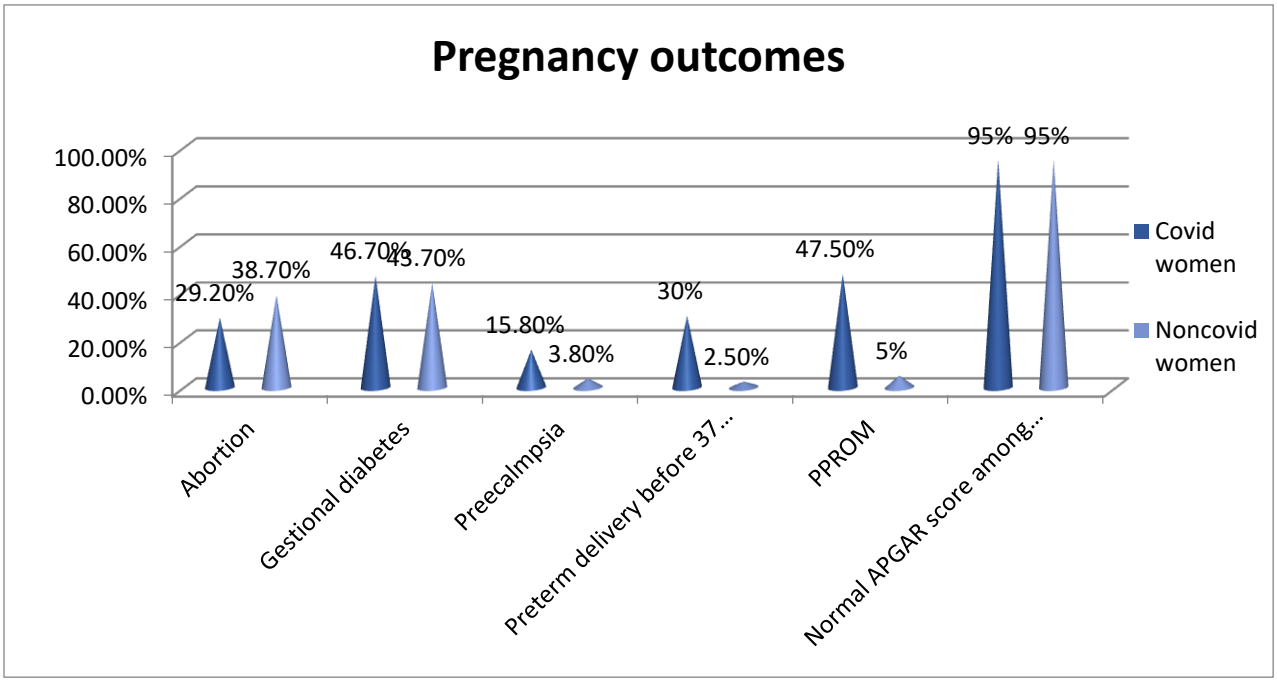


Figure (3): Presented the distribution of the studied sample according to the pregnancy outcomes

IV. DISCUSSION

One of the major concerns for maternity nurses during the Corona Virus (2) infection outbreak was whether the normal pregnant women would have negative outcomes compared with pregnant women of similar ages when infected with Corona virus (2) infection. It is vital and very important issue to study the maternal and neonatal characteristics among Covid pregnant women. So, this study investigated the effect of Corona virous-2 infection on pregnancy outcomes. The researcher illustrated the clinical characteristics, maternal and neonatal outcomes of the Covid and none Covid pregnant women in the following:

Clinical characteristics and outcomes of the Covid pregnant women:

This descriptive comparative study report clinical characteristics from (120) pregnant women with Corona virus (2) infection which found that the clinical data of these women with Corona virus (2) pneumonia during pregnancy were similar to those of the non-pregnant adults with Corona virus (2) viral infection, as reported by ***[26,27]***. 4.2% (5/120) of pregnant women did not present with any symptoms, but most of these women were diagnosed as having Corona virus (2)

viral pneumonia based on their clinical criteria. Our study indicated that the most common symptoms at presentation were fever (49%), cough (12.5%), and fatigue (11%); 44% of the women had increased C-reactive protein, and 13% of the women had abnormal chest CT scan revealing multiple patches of ground-glass opacity in the lungs. The study had reported clinical laboratory and radiologic characteristics that are similar to the published pregnant and nonpregnant cases of Corona virus (2) infection . Notably, our study congruent with Guan et al, 2020 and Wuz and McGoogan, 2019 which illustrated that there were no differences between pregnant and non-pregnant women in the clinical characteristics of the Corona virus (2) infection ***[26,27]***.

This result supported also by ***[28,29]*** which shown that the clinical, radiological, and laboratory characteristics of Corona (2) viral pneumonia in pregnant women are similar to those reported for non-pregnant women. World Health Organization (***WHO***) has reported that there is no apparent differences in the risk of developing clinical symptoms between pregnant and non-pregnant women of the same reproductive age ***[30]***. In the other way, another study has been reported that the main complaints on admission were slightly different, with fever and cough being more frequent in the non-pregnant women, while abdominal pain was only reported among pregnant women and there were no significant associations between pregnancy and the severity of the disease ***[31]***.

Maternal and neonatal outcomes among pregnant women:

The study estimated that the rate of the spontaneous abortion was (29.2%) , the rate of preterm birth before 37 weeks was (30%) , tow-third of which had PPROM that resulted in (47.5%) spontaneous preterm birth rate among Covid pregnant women. Our data were an expanded series that included (33) published cases. ***[32,33,34]*** It has been reported that Covid-19 viral pneumonia in the pregnant women is associated with an increased risk of abortion, preterm birth, fetal growth restriction (FGR), and perinatal mortality ***[35,36,37]***. These results congruent with the study of (Chen et al, 2020) which stated that pregnant women infected with other respiratory viruses, such as H1N1 influenza and Covid-19 virus, were reported to experience more adverse fetal events, for example miscarriage in the early trimester of pregnancy, fetal distress, and intrauterine growth restriction.

Based on the nationwide population-based data, it has been indicated that the pregnant women with viral pneumonia other than Corona virus (2) infection have an increased risk of preeclampsia, preterm birth, fetal growth restriction, and having a newborn with low birth weight(LBW) and Apgar score <7 at 5 minutes compared with those without viral pneumonia infection ***[38,39,40,41]***.

On the same line, cases from Peru ***[42]***, Spain ***[43]***, Iran ***[44,45]***, and United Kingdom ***[46]*** showed adverse pregnancy outcomes that may be due to early detection of infection before gestational age of (35) weeks. These findings suggest that acquiring infection at an early gestational age might lead to worse or negative pregnancy outcomes. Although these studies did not report the psychological health of the infected women, psychological health especially anxiety, depression, and stress of the pregnant women have been associated with preterm birth including low birth weight ***[47,48]***. Furthermore, an interplay between viral infections with poor psychological health may have deleterious or fatal effects on maternal and neonatal health. So, during this pandemic, the pregnant women need a grate emotional support to prevent maternal and neonatal complications.

By contrast, (Sharma et al., 2020) conducted another study enrolled (16) pregnant women with COVID-19 and (45) pregnant women without infection in their third trimester. The results did not indicate any increased risk of perinatal complications in the Covid-19 viral infected women, including the occurrence of severe preeclampsia, premature rupture of the membrane, fetal distress, meconium-stained amniotic fluid, premature delivery, neonatal asphyxia, and postpartum hemorrhage. In the same line, there was a study found reassuring data suggesting that the risk of spontaneous abortion is not increased in the pregnant women with SARS-CoV-2 viral infections from the background risk of the general population ***[49]***.

In contrast of the study, case reports from Korea ***[50]***, India ***[51]***, Netherlands ***[52,53]***, Australia ***[54]***, Italy ***[55]***, Ireland ***[56]***, and Turkey ***[57]*** did not show any adverse pregnancy or neonatal outcomes. Another study estimated that all of the cases were detected after the gestational age of (35) weeks risk for preterm delivery ***[58]***.

One main focus of this study was to investigate the possibility of vertical transmission of Corona virous-2 infection. The researcher chose to evaluate amniotic fluid, cord blood, and neonatal pharyngeal swab samples at birth to ascertain the

possibility of vertical transmission. The results indicated that Corona virous-2 infection was negative in all of the above biological samples, suggesting that no intrauterine fetal infection occurred because of Corona virous-2 infection during the third trimester of pregnancy when the time interval from clinical manifestation to delivery was up to 38 days. This findings are in agreement with what was observed with Corona virous-2 infection. On the same line, A recent review assessed 38 pregnant women and their newborns in China, and no evidence for vertical transmission was identified (Wang et al, 2020) ***[58]***. However, (3) recent research letters reported on (3) neonates born to women with confirmed COVID-19 who tested positive for immunoglobulin G and immunoglobulin M antibodies despite having a negative viral nucleic acid result ***[59,60,61]*** ,raising the possibility of vertical transmission, but more data are needed. In addition, this study explored whether vaginal delivery increases the risk of mother-to-child transmission during delivery by evaluating the vaginal secretions of COVID-19 cases at presentation and these samples had negative results. In this expanded series, our results further showed negative results for breast milk samples from (12) mothers with COVID-19 that were tested for SARS-CoV-2 infection ***[62]*** . In contrast, based on case series studies there was study reported that a (1 %) prevalence of COVID-19 in neonates. (6) neonates had COVID infection reported in case studies, one in vaginal delivery ***[63]*** and others in the cesarean delivery ***[64,65,66,67,68,69,70,71]***.

V. CONCLUSION

The clinical criteria of the pregnant women with Corona virus (2) pneumonia are similar to those of nonpregnant women with the same viral pneumonia. Currently, there is no evidence that pregnant women with Corona virus (2) are more prone to experience severe pneumonia than nonpregnant patients. Reassuringly, the risks of postpartum complications are not increased, but Covid pregnant women were prone to spontaneous abortion , preeclampsia, and preterm labor. There is no evidence of vertical transmission of Corona virus (2) when the infection manifests during the third trimester of pregnancy. We need in the future research ongoing collection of the clinical data with the aim to answer some of the questions in relation to the risks of congenital infection, intrapartum management, mode of delivery, teratogenic effects of the virus and vaccine on pregnancy, and also the vertical transmission potential from the mother to the fetus among Covid pregnant women.

VI. RECOMMENDATIONS

The "results of the current study" emphasize the importance of further researches to investigate the teratogenic effect of Corona virus (2) on pregnancy, test the vertical transmission of the virus from the mother to the fetus, and estimate if there is Corona virus (2) transmission to the newborn by breastfeeding. Test also the teratogenic effects of antiviral medications on pregnancy. careful and further management is required to reduce the risk of adverse pregnancy outcomes among patients who acquired infection at an early gestational week. It is important to evaluate the psychological health of Covid pregnant women.

REFERENCES

[1] Huang C, Wang Y, Li X, et al.: Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet (2020);395:497–506.

[2] Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. COVID-19 dashboard. (2020). Available at: https:// www.arcgis.com/apps/opsdashboard/index. html#/bda7594740fd40299423467b48e9ecf6. Accessed March 24, 2020.

[3] World Health Organization. : Novel coronavirus in China. Available at: https://www.who.int/csr/don/12-january-(2020)-novel-coronavirus-china/en/. Accessed March 7, 2020.

[4] Su S, Wong G, Shi W, et al. :Epidemiology, genetic recombination, and pathogenesis of coronaviruses. Trends Microbiol (2016);24: 490–502.

[5] Ksiazek TG, Erdman D, Goldsmith CS, et al. :A novel coronavirus associated with severe acute respiratory syndrome. N Engl J Med (2003);348:1953–66.

[6] Zaki AM, van Boheemen S, Bestebroer TM, Osterhaus AD, Fouchier RA. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N Engl J Med (2012);367:1814–20.

[7] World Health Organization. :Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. Available at: https://www.who.int/csr/sars/country/table(2004)_04_21/en/. Accessed January 19, 2020.

[8] World Health Organization.:Middle East respiratory syndrome coronavirus (MERS-CoV). MERS monthly summary, November (2019). Available at: http://www.who.int/emergencies/ mers-cov/en/. Accessed January 25, 2020.

[9] Wong SF, Chow KM, Leung TN, et al.:Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. Am J Obstet Gynecol (2004);191:292–7.

[10] Lu R, Zhao X, Li J, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet (2020);395:565–74.

[11] World Health Organization. :WHO Director-General's opening remarks at the media briefing on COVID-1 - 3 March 2020. Available at: https://www.who.int/dg/speeches/detail/ who-director-generals-opening-remarks-at-the-media-briefing-on-covid-19—3-march-2020. Accessed March 7, 2020.

[12] Wu JT, Leung K, Bushman M, et al. Esti-mating clinical severity of COVID-19 from the transmission dynamics in Wuhan, China. Nat Med (2020);26:506–10.

[13] Gottfredsson M. The Spanish flu in Iceland 1918. Lessons in medicine and history. Laeknabladid (2008);94:737–45.

[14] Jamieson DJ, Honein MA, Rasmussen SA, et al. H1N1 (2009) influenza virus infection during pregnancy in the USA. Lancet 2009;374:451–8.

[15] Schwartz DA, Graham AL. Potential maternal and infant outcomes from (Wuhan) coronavirus 2019-nCoV infecting pregnant women: lessons from SARS, MERS, and other human coronavirus infections. Viruses (2020);12: 194

[16] Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical trans-mission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet (2020);395:809–15.

[17] Zhu H, Wang L, Fang C, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCov pneumonia. Transl Pediatr (2020);9:51–60.

[18] Liu Y, Chen H, Tang K, Guo Y. Clinical manifestations and outcome of SARS-CoV-2 infection during pregnancy. J Infect (2020) [Epub ahead of print].

[19] Zhang L, Jiang Y, Wei M, et al. :Analysis of the pregnancy outcomes in pregnant women with COVID-19 in Hubei Province. Zhonghua Fu Chan Ke Za Zhi (2020);55:E009.

[20] Lei D, Wang C, Li C, et al. :Clinical characteristics of COVID-19 in pregnancy: analysis of nine cases. Chin J Perinat Med. (2020);23: 159–65.

[21] Ambe, J., Bello, M., Yahaya, S. & Omotora, B. (2010): Calculating sample size, Journal of Tropical Medicine (9)

[22] Apgar(1953). "A proposal for a new method of evaluation of the newborn infant"(PDF). Current Researches in Anesthesia & Analgesia. 32 (4): 260–7. doi:10.1213/00000539-195301000-00041. PMID 13083014.

[23] Finster M, Wood M (April 2005). "The Apgar score has survived the test of time". Anesthesiology. 102 (4): 855–7. doi:10.1097/00000542-200504000-00022. PMID 15791116. S2CID 19697516.

[24] Sun.W, Chou. C. P, Stacy.A, Unger.J, & Gallaher. P (2007): SAS and SPSS Macros to Calculate Standardized Cronbach's Alpha using the Upper Bound of the Phi -Coefficient for Dichotomous Items. Behavior ResearchMethods, -39(1), 71-81.

[25] Tavakol.M, and Dennick. R (2011): Making Sense of Cronbach's Alpha. International journal of Medical Education 2, 53. (6): 87 – 92.

[26] Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med (2020) [Epub ahead of print].

[27] Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. JAMA 2020 [Epub ahead of print].

[28] National Health Commission of China.: New Coronavirus Pneumonia Prevention and Control Program, (2020). 4th ed (in Chinese). Available at: http://www.gov.cn/zhengce/zhengceku/2020-02/07/5475813/files/9a774a4defee44daa058 94138bd0509a.pdf. Accessed March 24, 2020.

[29] National Health Commission of China. New Coronavirus Pneumonia Prevention and Control Program, (2020). 5th ed (in Chinese). Available at: http://www.nhc.gov.cn/yzygj/s7653p/202002/d4 b895337e19445f8d728fcaf1e3e13a/files/ ab6bec 7f93e64e7f998d802991203cd6.pdf. Accessed March 24, 2020.

[30] Aylward B, Liang W, Dong X, Eckmanns T, Fisher D, Ihekweazu C. :Report of the WHO-China joint mission on coronavirus disease (2019) (COVID-19) [Internet].

[31] Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes. Arch Pathol Lab Med 2020.

[32] National Health Commission of China. New Coronavirus Pneumonia Prevention and Control Program, (2020). 6th ed (in Chinese). Available at: http://www.nhc.gov.cn/jkj/s3577/202003/4856d5b0458141fa9f376853224d41d7/files/4132b f035bc242478a6eaf157eb0d979.pdf. Accessed March 24, 2020.

[33] National Health Commission & National32. Administration of Traditional Chinese Medicine. Diagnosis and treatment protocol for novel coronavirus pneumonia (trial version 7). Chin Med J (Engl) (2020):133.

[34] Metlay JP, Waterer GW, Long AC, et al. :Diagnosis and treatment of adults with community-acquired pneumonia. An official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med (2019);200:e45–67.

[35] World Health Organization. :Laboratory testing for 2019 novel coronavirus (2019-nCoV) in suspected human cases. Interim guidance. Available at: https://www.who.int/publications-detail/laboratory-testing-for-(2019)-novel-coronavirus-in-suspected-human-cases-20200117. Accessed March 24, 2020.

[36] Cunningham FG, Leveno KJ, Bloom SL, et al. Williams Obstetrics. 25th ed. Appendix 1. New York: McGraw-Hill Education; (2018).

[37] Naccasha N, Gervasi MT, Chaiworapongsa T, et al. :Phenotypic and metabolic characteristics of monocytes and granulocytes in normal pregnancy and maternal infection. Am J Obstet Gynecol (2001);185: 1118–23.

[38] Madinger NE, Greenspoon JS, Ellrodt AG. Pneumonia during pregnancy: has modern technology improved maternal and fetal outcome? Am J Obstet Gynecol (1989;161: 657–62.

[39] Chen YH, Keller J, Wang IT, Lin CC, Lin HC. Pneumonia and pregnancy outcomes: a nationwide population-based study. Am J Obstet Gynecol (2020);207:288.e1–7.

[40] H Al Wattar B, Murugesu N, Tobias A, Zamora J, Khan KS. :Management of first-trimester miscarriage: a systematic review and network meta-analysis. Hum Reprod Update (2019);25:362–74.

[41] Zeng H, Xu C, Fan J, et al. :Antibodies in infants born to mothers with COVID-19 pneumonia. JAMA (2020) [Epub ahead of print].

[42] Alzamora M.C., Paredes T., Caceres D., Webb C.M., Valdez L.M., La Rosa M. :Severe COVID-19 during pregnancy and possible vertical transmission. Am J Perinatol. (2020) [PMC free article] [PubMed] [Google Scholar]

[43] González Romero D., Ocampo Pérez J., González Bautista L., Santana-Cabrera L. :Pregnancy and perinatal outcome of a woman with COVID-19 infection. Rev Clin Esp. (2020) [PMC free article] [PubMed] [Google Scholar]

[44] Karami P., Naghavi M., Feyzi A., Aghamohammadi M., Novin Ms, Mobaien A. :Mortality of a pregnant patient diagnosed with COVID-19: a case report with clinical, radiological, and histopathological findings. Travel Med Infect Dis. (2020) [Google Scholar]

[45] Taghizadieh A., Mikaeili H., Ahmadi M., Valizadeh H. :Acute kidney injury in pregnant women following SARS-CoV-2 infection: a case report from Iran. Respir Med Case Rep. (2020);30 [PMC free article] [PubMed] [Google Scholar]

[46] Hong L., Smith N., Keerthy M., Lee-Griffith M., Garcia R., Shaman M. :Severe COVID-19 infection in pregnancy requiring intubation without preterm delivery: a case report. Case Rep Women Health. (2020) [PMC free article] [PubMed] [Google Scholar]

[47] Kirtsman M., Diambomba Y., Poutanen S.M., Malinowski A.K., Vlachodimitropoulou E., Parks W.T. :Probable congenital SARS-CoV-2 infection in a neonate born to a woman with active SARS-CoV-2 infection. CMAJ. (2020);192:E647–e50. [PubMed] [Google Scholar]

[48] Cooke W.R., Billett A., Gleeson S., Jacques A., Place K., Siddall J. :SARS-CoV-2 infection in very preterm pregnancy: experiences from two cases. Eur J Obstet Gynecol Reprod Biol. (2020);250:259–260. [PMC free article] [PubMed] [Google Scholar]

[49] Yu Y., Fan C., Bian J. YinShen. :Severe COVID-19 in a pregnant patient admitted to hospital in Wuhan. Int J Gynaecol Obstet. (2020) [PubMed] [Google Scholar]

[50] Dong L, Tian J, He S, et al. :Possible vertical transmission of SARS-CoV-2 from an infected mother to her newborn. JAMA (2020) [Epub ahead of print].

[51] Sharma Ka, Kumari R., Kachhawa G., Chhabra A., Agarwal R., Sharma Ka. Management of the first patient with confirmed COVID-19 in pregnancy in India: from guidelines to frontlines. Int J Gynaecol Obstet. (2020) [PubMed] [Google Scholar]

[52] Peng Z., Wang J., Mo Y., Duan W., Xiang G., Yi M. :Unlikely SARS-CoV-2 vertical transmission from mother to child: a case report. J Infect Public Health. (2020);13:818–820. [PMC free article] [PubMed] [Google Scholar]

[53] Mehta H., Ivanovic S., Cronin A., VanBrunt L., Mistry N., Miller R. Novel coronavirus-related acute respiratory distress syndrome in a patient with twin pregnancy: a case report. Case Rep Women Health. 2020;27:e00220. [PMC free article] [PubMed] [Google Scholar]

[54] Lu D., Sang L., Du S., Li T., Chang Y., Yang X.A. :Asymptomatic COVID-19 infection in late pregnancy indicated no vertical transmission. J Med Virol. (2020) [PMC free article] [PubMed] [Google Scholar]

[55] Kalafat E., Yaprak E., Cinar G., Varli B., Ozisik S., Uzun C. :Lung ultrasound and computed tomographic findings in pregnant woman with COVID-19. Ultrasound Obstet Gynecol. (2020) [PubMed] [Google Scholar]

[56] Li Y., Zhao R., Zheng S., Chen X., Wang J., Sheng X. :Lack of vertical transmission of severe acute respiratory syndrome coronavirus 2, China. Emerg Infect Dis. (2020);26 [PMC free article] [PubMed] [Google Scholar]

[57] Fan C., Lei D., Fang C., Li C., Wang M., Liu Y. :Perinatal transmission of COVID-19 associated SARS-CoV-2: should we worry? Clin Infect Dis. (2020) [PMC free article] [PubMed] [Google Scholar]

[58] Zambrano L.I., Fuentes-Barahona I.C., Bejarano-Torres D.A., Bustillo C., Gonzales G., Vallecillo-Chinchilla G. :A pregnant woman with COVID-19 in Central America. Travel Med Infect Dis. (2020) [PMC free article] [PubMed] [Google Scholar]

[59] Wang S., Guo L., Chen L., Liu W., Cao Y., Zhang J. :A case report of neonatal COVID-19 infection in China. Clin Infect Dis. (2020) [Google Scholar]

[60] Wang X., Zhou Z., Zhang J., Zhu F., Tang Y., Shen X. :A case of 2019 Novel Coronavirus in a pregnant woman with preterm delivery. Clin Infect Dis. (2020) [PMC free article] [PubMed] [Google Scholar]

[61] Iqbal Sn, Overcash R., Mokhtari N., Saeed H., Gold S., Auguste T. :An uncomplicated delivery in a patient with Covid-19 in the United States. N Engl J Med. (2020);382:e34. [PMC free article] [PubMed] [Google Scholar]

[62] Gidlof S., Savchenko J., Brune T., Josefsson H. :COVID-19 in pregnancy with comorbidities: more liberal testing strategy is needed. Acta Obstet Gynecol Scand. (2020) [PubMed] [Google Scholar]

[63] Peng Z., Wang J., Mo Y., Duan W., Xiang G., Yi M. :Unlikely SARS-CoV-2 vertical transmission from mother to child: a case report. J Infect Public Health. (2020);13:818–820. [PMC free article] [PubMed] [Google Scholar]

[64] Chen S., Huang B., Luo D.J., Li X., Yang F., Zhao Y. :Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of six cases. Zhonghua Bing Li Xue Za Zhi. (2020);49:E005. [PubMed] [Google Scholar]

[65] Blauvelt Ca, Chiu C., Donovan Al, Prahl M., Shimotake Tk, George Rb. :Acute respiratory distress syndrome in a preterm pregnant patient with coronavirus disease 2019 (COVID-19) Obstet Gynecol. (2020) [PubMed] [Google Scholar]

[66] Li J., Wang Y., Zeng Y., Song T., Pan X., Jia M. :Critically ill pregnant patient with COVID-19 and neonatal death within two hours of birth. Int J Gynaecol Obstet. (2020) [PubMed] [Google Scholar]

[67] Browne P.C., Linfert J.B., Perez-Jorge E.:Successful treatment of preterm labor in association with acute COVID-19 infection. Am J Perinatol. (2020) [PMC free article] [PubMed] [Google Scholar]

[68] Alzamora M.C., Paredes T., Caceres D., Webb C.M., Valdez L.M., La Rosa M. :Severe COVID-19 during pregnancy and possible vertical transmission. Am J Perinatol. (2020) [PMC free article] [PubMed] [Google Scholar]

[69] Chen S., Huang B., Luo D.J., Li X., Yang F., Zhao Y. :Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of three cases. Zhonghua Bing Li Xue Za Zhi. (2020);49:E005. [PubMed] [Google Scholar]

[70] Xu Qianchenga, Shen Jianb, Pan Linglingc, Huang Leib, Jiang Xiaogana, Lu Weihuaa, Yang Gangd, Li Shirongd, Wang Zhena, Xiong GuoPingb, Zha Leie,f, the sixth batch of Anhui medical team aiding Wuhan for COVID-19: *International Journal of Infectious Diseases*, Coronavirus disease (2019) in pregnancy: www.elsevier.com/locate/ijid

[71] Lee D.H., Lee J., Kim E., Woo K., Park H.Y., An J. :Emergency cesarean section on severe acute respiratory syndrome coronavirus 2 (SARS- CoV-2) confirmed patient. Korean J Anesthesiol. (2020) [PMC free article] [PubMed] [Google Scholar]