ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

An overview of COVID-19 infection during Pregnancy in a tertaiary care centre.

Dr Anusha G K[1], Dr Swathi Bhat[2], Dr Ambika H E[3],Dr Soujanya C S[4*], Dr Jeevanthy Upadhyaya[5], Dr Lepakshi B G[6]

[1]Assistant Professor, department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.
[2]Assistant Professor, department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.
[3]Associate Professor, department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.
[4]Senior Resident, department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.
[5]Senior Resident, department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.
[6]Professor and Head of the department of ObG, Shivamogga Institute of Medical Sciences, Shivamogga.

Corresponding Author: DrSoujanya C S

Background:

SARS-CoV-2 is a novel Coronavirus with high pandemic potential. In the absence of any preexisting guidelines the disease has thrown the entire medical fraternity into clinical dilemma.The impact of COVID-19 infection on maternal health is unclear. This study is an effort to know the effects of COVID-19 infection on pregnancy and its adverse effects on maternal and neonatal morbidity and mortality.

Objectives:

1. To enumerate the clinical presentation and pregnancy outcomes in patients with COVID-19.
2. To assess the maternal and neonatal morbidity and mortality due to COVID-19.

Materials and methods:

1. Study setting: Department of Obstetrics and Gynaecology at Tertiary Care Hospital attached to a Medical College located in Shivamogga.
2. Study design: Retrospective Observational Descriptive Ecological study.
3. Sample size: All the pregnant women admitted between March 2020 to July 2021
4. Selection criteria: All the pregnant women admitted between March 2020 to July 2021.
5. Study methodology:
   Medical records of all the pregnant women admitted in the above mentioned study period were procured. The following data will be collected and analysed: demographic details, clinical features, treatment received, RAT/RT-PCR for COVID-19, pregnancy outcomes, associated co-morbidities, complications and maternal morbidity and mortality.
6. Data collection instruments:

1) Demographic Profile:

- Age
- Parity
- Residence
- Contact history (with COVID+)
- Gestational age

2) Symptoms on admission

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

3) Associated Comorbidities

- HTN/PIH/Eclampsia
- Anemia
- DM/GDM
- TB/Asthma/LRTI
- Hypothyroidism
- HIV/HBSAG/HCV
- Epilepsy
- Others

4) Mode of Delivery

- Vaginal delivery
- Instrumental
- LSCS

5) Maternal Complications

- Abortions
- Ectopic pregnancy
- APH
- PPH
- Maternal deaths
- Others

6) Management protocol

- Standard treatment
- Covid care treatment
- ICU care – O2 support
- Ventillatory support

7. Statistical analysis: All the maternal parameters will be analysed using descriptive statistics i.e. percentages and proportions.

RESULTS:

A total of 363 COVID-19 positive pregnant women were included in the study. Majority of the cases were in the third trimester of pregnancy. 15.15% cases were symptomatic with fever, cough, fatigue and 4.4% cases had breathlessness. 14.43% cases were associated with comorbidities. 55.92% cases were delivered by Cesarean section and 23.14% by vaginal route. Most common indication for C-section is previous C-section. 287 babies were healthy at birth with 7-10 APGAR score. Maternal complications were noted in 6.06% cases. The rate of maternal death is 4.13% and ARDS with COVID Pneumonia with type I respiratory failure is the most common cause of maternal death.

CONCLUSION:

The results of this study suggests that majority of the COVID positive women were discharged without any major maternal complications and with least neonatal complications.

KEYWORDS:

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

COVID-19 infection, pregnancy, maternal and neonatal outcome.

Introduction:

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is a novel Coronavirus with high pandemic potential (1) spreading to a number of countries overseas and thus declared as a Public Health Emergency of International Concern by the WHO on 30 January 2020. (2)

Ever since the first outbreak of COVID-19 disease there has been relentless research work on: ecology, evolution, etio-pathogenesis, clinical manifestations and recommendations to prevent, detect and cure the disease. Studies have proved that this disease is highly transmissible; the mode of transmission is by droplets, the incubation period is 2 days to 2 weeks and the most common symptoms are cold, cough, fever, malaise, headache and few may also present with multiorgan failure. (3) The standard diagnostic test is detection of the viral RNA by RT-PCR (Reverse Transcriptase Polymerase Chain Reaction) from the nasopharyngeal mucosa. (4)

In many countries death and disability is directly linked to COVID-19. (5) The case fatality rate of COVID-19 is around 3.4%. This could vary depending on factors such as age, comorbidities and healthcare capacity; posing maximum threat to the older people and those with pre-existing medical conditions like high BP, heart problems and diabetes. (3)

Pregnant women are vulnerable to infectious diseases because their immune system is physiologically down-regulated to be able to tolerate pregnancy. (6) Diaphragmatic splinting by the gravid uterus reduces the total lung capacity and the ability to clear secretions making them more susceptible to infection.Pneumonia is the most prevalent non-obstetric infectious condition that occurs during pregnancy and viral pneumonia has higher levels of morbidity and mortality during pregnancy. (7) This has been evident during previous epidemics. In 2003 SARS-CoV infection was found tobe associated with severe maternal illness, maternal death and spontaneous abortion. (8)In 2012 MERS-CoV infection lead to severe clinical outcomes in pregnancy. (9)

Coronavirus disease has thrown the entire medical fraternity into clinical dilemma in the absence of preexisting guidelines. The impact of COVID-19 infection on maternal health is unclear. (10) Pregnant women can develop altered response to SARS-CoV-2 because the physiologic changes of pregnancy involve cardio-respiratory and immune systems. (11) In the backdrop of this pandemic, it thus becomes imperative to study the effects of COVID-19 infection on pregnancy and know the adverse effects on maternal and neonatal morbidity and mortality. This can help us to bridge the gaps in our knowledge about the disease and also help to formulate guidelines in the management of COVID-19 infection during pregnancy.

Materials and methods:

This is a retrospective observational descriptive study done in the department of ObGat a tertiary care centre attached to a Medical College located in Shivamogga District which receives patients from 8 Taluks. The hospital conducts deliveries of approximately 8000 women every year. This population-based study aims to assess the effects of COVID-19 infection on the maternal morbidity and mortality, clinical presentation, birth outcomes, management protocols and prognosis in pregnant women with COVID-19 infection. The Institutional Ethics Committee approval was taken for the study.

All the obstetric cases irrespective of the gestational agewith symptoms of COVID-19 like cold, cough, fever, malaise, headache, respiratory discomfort or multiorgan failure were tested for COVID-19 infection. Also, women with labor symptoms like pain abdomen, bleeding/ leak per vaginum, with or without obstetric complications, viz abortion, ectopic pregnancy, hyperemesis gravidarum, anemia, hypertension disorders of pregnancy (HDP) or any other medical conditions admitted for obstetric care were tested for COVID-19. All the antenatal cases who were likely to

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

deliver in next 10 days were tested for COVID-19 even if asymptomatic. Also COVID-19 positive patients in the puerperal period referred from other hospitals were included in the study.

The patients were tested for COVID-19 infection using Rapid Antigen Testing (RAT) on emergency basis. If tested RAT negative a confirmatory test of RT-PCR (Reverse Transcriptase Polymerase Chain Reaction) was done. RAT positive and RT-PCR positive cases were isolated in the COVID care block of the hospital. The necessary obstetric care and COVID care was given to these patients. RAT negative cases whose RT-PCR report was awaited were isolated in a separate ward and obstetric care was given in labor OT named as COVID suspect labor OT. All the antenatal cases who were likely to deliver in next 10 days were sent for RT-PCR testing from the ANC OPD.

The swabs were collected after wearing complete PPE (Personal protective equipment) and were transferred in a VTM (viral transport medium) and sent to the microbiology department for testing. All the patients were advised to wear a mask and all the health care workers were using complete PPE during their shifts in the labour ward, postnatal ward and the OT complex. To reduce the risk of transmission, we carried out several measures including creating awareness about hand hygiene and usage of masks in all patients, maintaining a distance between beds and a strict and correct use of personal protective equipment (PPE) among the health care workers. A sensitization program on donning and doffing of PPE was conducted for the staff. Separate rooms for donning and doffing were assigned in the labour ward and OT complex. Cleaning and disinfection of the labour room and OT was done on regular and frequent intervals.

OBG staffs were assigned round the clock duty in the COVID care block and also the COVID suspect wards. Symptomatic and also asymptomatic COVID positive patients received obstetric care including fetal heart rate monitoring using doppler, monitoring the progression of labor and conducting the delivery, treatment of obstetric complications like HDP, anemia e,tc. Symptomatic patients requiring oxygen or ventilatory support were managed in a separate ward in consultation with the physician. Asymptomatic COVID positive patients were discharged on day 10. The newborn babies were attended by the paediatricians. Rooming-in was recommended and direct breastfeeding was encouraged in these patients. Mothers were instructed to wear a medical mask, when they were near their baby and perform hand hygiene before close contact with the baby. The case sheets of these inpatients were updated with all the necessary history, examination findings and treatment ensued.

With the permission from the hospital administrative authority the medical records of all the COVID positive pregnant patients admitted in the above mentioned study period were obtained. The following data about these patients was collected: age, parity, gestational age, address, symptoms on admission, mode of delivery, baby details, associated comorbid conditions, treatment given, maternal morbidity and mortalitywere noted.

All the maternal and neonatal parameters were analysed using descriptive statistics i.e. percentages and proportions.

Results:

A total of363COVID-19 positive pregnant women were included in the study period from March 2020 to July 2021. Among them 105 patients gave a history of contact with patients diagnosed with COVID-19 infection and 258 were community acquired cases.266 patients were from different Taluks of Shivamogga and 97 hailed from other districts of Karnataka. 181 cases out of 363 COVID positive patients were found in the age group of 21–25 years. There were 186 multigravidae and 168 primigravidae patients. We had 265 patients with 37 -42weeks of gestation, 49 patients were preterm,

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

23 patients with less than 20 weeks, 9 patients were admitted in post-operative period and 2 patients were in postnatal period.

Table 1: Demographic profile of the patients (n = 363)

Parameters	COVID positive mothers (n)	Percentage (%)
Age group (years)		
>35 18-20 21-25 26-30 31-35	7 50 181 103 22	1.92 13.77 49.86 28.37 6.06
Residence		
Shivamogga Outside district	266 97	73.28 26.72
Parity		
Primi Multi Grandmulti	168 184 11	46.28 50.68 3.03
Gestational age(weeks)		
<20 20-28 28-33.6 34-36.6 37 -42 Post - natal Post op	23 15 18 31 265 2 9	6.33 4.13 4.95 8.53 72.17 0.55 2.47

276 patients were admitted with labor symptoms like pain abdomen, leak or bleeding per vaginum; 55 cases had fever, cough and fatigue; 16 cases had breathlessness, 10 patients got admitted for abortion, 3 cases of ectopic pregnancy, 2 cases of hyperemesis and1 case of burst abdomen.

Table 2: Symptoms on admission

SYMPTOMS	Number of patients(n)	Percentage (%)
Abortion	10	2.75
Ectopic pregnancy	3	0.82
Burst abdomen	1	0.27
Hyperemesis	2	0.55
Labor symptoms	276	76.03

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

Fever, cough, fatigue	55	15.15
Breathlessness	16	4.41

311 cases had no associated comorbidities, 15 were diagnosed with Preeclampsia, 1 Eclampsia, 1 Abruptio placenta with DIC, 16 cases of anemia, 6 cases of GDM, 5 cases of hypothyroidism, 1 case of hyperthyroidism, 1 Hepatitis B positive, 1 retropositive case, 1 asthmatic case, 1 epilepsy, 1 case with congenital heart disease, 1 case with ishchaemic heart disease, 3 cases with placenta praevia and 1 case with IUD.

Table 3: Associated Comorbidities

Associated comorbidities	Number of Patients(n)	Percentage (%)
GDM	4	1.1
Asthma	1	0.27
Hypertensive disorder of pregnancy	15 PIH + 1 Eclampsia+ 1 Abruption, IUD, DIC+ 2 GDM	5.23
Anaemia	16	4.41
Thyroid disorder	5 Hypo + 1 Hyper	1.65
Seropositive	1 HIV + 1 HBsAg	0.55
Heart Disease in pregnancy	1 CHD + 1 IHD with PTCA	0.55
Epilepsy	1	0.27
IUD	1	0.27
None	311	85.67
Grand total	363	100

203 cases (55.92%) were delivered by Cesarean section, 84 cases (23.14%) by vaginal delivery, 1 instrumental delivery, 45 cases were admitted during ANC period, 10 abortions, 3 cases underwent laparotomy for ectopic pregnancy, 9 post C-section and 2 post cases were referred with fever and respiratory symptoms and 4 cases with maternal death were undelivered.

Table 4: Mode of delivery

Mode of delivery	Number of patients(n)	Percentage (%)
Vaginal	84	23.14
C- Section	203	55.92
Laparotomy for ectopic	3	0.83
abortion	10	2.75
ANC	45	12.39
Instrumental	1	0.27
Secondary suturing	1	0.27
Post LSCS	9	2.47
PNC	2	0.55
Undelivered maternal death	4	1.12
	363	100

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

The indications for C-section are 94 cases for previous C-section, 45 cases CPD, 17 failed induction, 20 cases for non-reassuring fetal heart rate, 6 Breech, 7 PROM, 2 obstructed labor, 3 placenta praevia, 3 for precious pregnancy, 2 Polyhydraminos, 1 Oligohydraminos, 1 IUGR and 2 for maternal dyspnoea.

Table 5: Indications for C-section (n = 203)

INDICATION	Number	Percentage
Previous C-section	94	46.31
CPD	45	22.17
Breech	6	2.96
Failed induction	17	8.37
Fetal distress	9	4.43
MSAF	11	5.42
Obstructed labor	2	0.98
PROM	7	3.45
Placenta Praevia	3	1.48
Polyhydraminos	2	0.98
Oligohydraminos	1	0.49
IUGR	1	0.49
Precious pregnancy	3	1.48
Maternal dyspnoea	2	0.98
TOTAL	203	100

The birth weight of 259 babies (71.34%) was between 2.5 – 4kgs, 18 babies 1.5-2.49kgs, 17 babies the birth weight was more than 4kgs, 6 babies with less than 1.5kgs. 287 babies were healthy at birth with 9 APGAR score,7 macerated stillbirths of which 4 were preterm, 2 fresh still births both being less than 34weeks of gestation, 4 babies were shifted to NICU of which 1 baby was deeply asphyxiated and 3 were preterm with LBW.

Table 6: Details of the Newborn

Parameter	Number	Percentage
Birthweight(kgs)		
<1.5	6	1.65
1.5- 2.49	18 (10 Preterm + 7 Term +1 Twins)	4.95
2.5 - 4	259	71.34
>4	17 (1 GDM)	4.68
Others	63 (45 ANC cases+ 10 Abortion+ 4 Ectopic pregnancy+ 1 secondary suturing+ 4 undelivered maternal death)	17.35
Neonatal outcome		
healthy at birth	287	79.06
fresh still birth (both <34weeks)	2	0.55

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

macerated stillbirth (of which 4 were preterm)	7	1.93
NICU admission (1 – asphyxia, 3-Preterm with LBW)	4	1.1

288 cases (79.33%) were asymptomatic with COVID positive status. They were given obstetric treatment which included fetal heart rate monitoring using doppler, treatment of obstetric complications like HDP, anemia, GDM; monitoring the progression of labor and conducting the delivery by C-section or vaginal delivery. They were discharged on 10th day. 57 cases who were symptomatic received COVID care treatment in consultation with the physician. 18 cases (4.95%) were admitted to ICU.4 patients received ICU care with O2 support and 14 cases were put on ventilatory support.

Maternal complications were noted in 22 cases (6.06%) in both the groups. The rate of maternal death is 4.13% (15 cases). The cause of death in 13 cases (3.58%) is ARDS with COVID Pneumonia with type I respiratory failure, 1 case (0.27%) due to CCF and 1 case (0.27%) was RAT negative with CORAD score 18/25.

Table 7: Maternal complications

Maternal complications	Number of patients	Percentage (%)
Maternal Death	15	4.13
Placenta previa	3	0.83
Abruption	1	0.27
Eclampsia	1	0.27
IUD	1	0.27
Epilepsy	1	0.27
None	341	93.94
TOTAL	363	100

Table 8:Details of Maternal deaths

Cause of death	**Number of patients (n)**	**Percentage %**
ARDS, COVID Pneumonia, Type I respiratory failure	13	3.58
CCF	1	0.27
RAT negative, CORAD score 18/25	1	0.27

Discussion:

A novel Coronavirus SARS-CoV-2 has caused COVID-19 infection resulting into a global public health emergency. However, there is a very limited data currently available on maternal outcomes in COVID-19 infection in pregnancy. (12)The current retrospective observational study aims to describe the effects of COVID-19 infection on 363 pregnant women who were admitted in the tertiary care centre in Shivamogga over the period from March 2020 to July 2021. 258 cases (71.07%) were community acquired and history of contact with patients diagnosed with COVID-19 infection was noted in 105 cases(28.92%). This emphasizes the need forself care by wearing mask as the infection spreads by droplets.

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

In our study most pregnant women acquired the infection in the third trimester of pregnancy and were in the age group of 21–25 years. This could be because of mandatory testing of pregnant women for COVID-19 infection at term. Similar findings were noted Liu et al (13) and Fan et al (14).Majority of the cases in the study were admitted for obstetric indications, only 55 cases (15.15%) were symptomatic with fever, cough, fatigue and16(4.4%) had breathlessness. This result is contrary to Abdul Rahman et al study (15) where 85.8% of pregnant women were symptomatic with COVID-19 infection. In our study 14.43% cases were associated withcomorbidities, 4.68% cases were diagnosed with Hypertensive disorders of pregnancy, 4.4% cases with anemia, 1.65% cases with GDM, 1.65% cases thyroid disorders, 0.28% cases each with asthma, epilepsy, CHD, IHD and IUD. In ArunNayak et al (16) 27 COVID positive patients (19.14%) had comorbidities like anaemia, pregnancy-induced hypertension and eclampsia.

A recent systematic review and meta-analysis indicated that the prevalence of cesarean section was detected in several studies where the pooled percentage of cesarean section was 88%.(17)In this study 84 cases (23.14%) had vaginal delivery and 203 cases (55.92%) were delivered by C-section with majority for obstetric indications like 94 cases (25.89%) for previous C-section, 45 cases (12.39%) for CPD, 7 cases (1.92%) for prolonged PROM, 6 cases (1.65%) for breech and 3 cases (0.82%) for placenta praevia. C-section was done on 29 cases (7.99%) with failed trial of labor with 20 cases for non-reassuring fetal heart rate, 17 for failed induction and 2 for obstructed labor. Similar results were noted in ArunNayak et al(16) studywhere the number of patients who were delivered by LSCS in COVID positive patients was 50% and LSCS was done for obstetric indications only. Also in 2 cases (0.55%) C-section was indicated for severe maternal dyspnoea in the current study.

In the study the birth weight of 259 babies (71.34%) was between 2.5 – 4kgs, 287 babies (79.06%) were healthy at birth with 7 to 10 APGAR score and rest of the babies had perinatal mortality (9 cases) and perinatal morbidity (4 cases). This was consistent with the results in the study by ArunNayak et al(16) where majority of neonates had birth weight between 2.5 to 2.9 kg withAPGAR score being normal and low APGAR i.e. 0–3 was observed in 2 (1.52%) neonates.

COVID care treatment in consultation with the physician was given to 57 cases (15.7%). Maternal complications were noted in 22 cases (6.06%).18 cases (4.95%) were admitted to ICU with 4 patients receiving O2 support and 14 cases were put on ventilatory support. The rate of maternal death is 4.13% (15 cases). The cause of death in 13cases (3.58%) is ARDS with COVID Pneumonia with type I respiratory failure, 1 case (0.27%) had sudden death due to CCF and 1 case (0.27%) was RAT negative with CORAD score 18/25. In comparision with the current study ArunNayak et al(16) study showed 2.12% rate of maternal death with causes being severe anaemia with pneumonia with cardiogenic shock with HELLP syndrome in 2 cases, sepsis with hepatitis in 1 case and sepsis with acute kidney injury (AKI) in 1 case.

Conclusion:

The results of this study suggests that majority of the women were discharged without any major maternal complications and with least neonatal complications. Thus routine laboratory testing for COVID-19 infection for of all the obstetric inpatients is not necessary. It can be carried out in patients with COVID-19 symptoms and in cases with associated comorbidities. Collaborative treatment involving physicians is imperative for high risk cases which may demand ICU care. COVID-19 preventive strategy of self care by wearing mask has to be continued by the pregnant women.

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

Conflict of interest

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.The authors have no conflicts of interest to declare

References:

1. Mackenzie JS, Smith DW. COVID-19: A novel zoonotic disease caused by a coronavirus from China: what we know and what we don't. Microbiol Aust. 2020 doi: 10.1071/MA20013.
2. World Health Organization (2020) Novel coronavirus (2019-nCoV). 31 January 2020. https://www.who.int/docs/default source/coronaviruse/situation-reports/20200131-sitrep-11-ncov.pdf?sfvrsn=de7c0f7_4
3. Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of outbreak of COVID-19. Zhonghua Liu Xing Bing XueZaZhi. 2021;41(2):145–151
4. Corman VM, Landt O, Kaiser M, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. Euro Surveill. 2020;25(3):2000045.
5. Worldometer. COVID-19 coronavirus pandemic. 2021; https://www.worldometers.info/coronavirus/(accessed April 12, 2021).
6. A systematic review of pregnant women with COVID-19 and their neonates**.** Mona Mirbeyk et al. Arch Gynecol Obstet. 2021 Apr 2:1–34.
7. Rigby, F.B.; Pastorek, J.G. Pneumonia during pregnancy. Clin. Obstet. Gynecol. 1996, 39, 107–119.
8. Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. Am. J. Obstet. Gynecol. 2004, 191, 292–297. Wong, S.F et al.
9. MERS-CoV infection in pregnant woman in Korea. J. Korean Med. Sci. 2017, 32, 1717–1720. Jeong, S.Y et al.
10. Impact of the Coronavirus Infection in Pregnancy: A Preliminary Study of 141 Patients. ArunHarishchandraNayak et al. J of Obs and Gyne of India 2020 Aug; 70(4): 256–261.
11. The impact of COVID-19 on pregnancy outcomes: a systematic review and meta-analysis. Shu Qin Wei et al. *CMAJ* 2021 April 19;193:E540-8.
12. Capobianco G., Sadri L., Aliberti S., Mondoni M., Piana A., Dessole F. COVID-19 in pregnant women: a systematic review and meta-analysis. *Eur J ObstetGynecolReprod Biol.* 2020;252:543–558. [PMC free article] [PubMed] [Google Scholar]
13. Liu H, Liu F, Li J, et al. Clinical and CT imaging features of the COVID-19 pneumonia: focus on pregnant women and children. J Infect. 2020;80:e7–e13. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
14. Fan C, Lei D, Fang C, et al. Perinatal transmission of COVID-19 Associated SARSCoV- 2: should we worry? Clin Infect Dis. 2020 doi: 10.1093/cid/ciaa226. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
15. Abdulrahman Al-Matary et al. Clinical outcomes of maternal and neonate with COVID-19 infection – Multicenter study in Saudi Arabia. 2021 Jun; 14(6): 702–708. Published online 2021 Apr 20. J Infect Public Health.
16. ArunHarishchandraNayak et al. Impact of the Coronavirus Infection in Pregnancy: A Preliminary Study of 141 Patients. J of Obs and Gyne of India 2020 Aug; 70(4): 256–261.
17. Giampiero Capobianco et al. COVID-19 in pregnant women: a systematic review and meta-analysis. *Eur J ObstetGynecolReprod Biol.* 2020;252:543–558. [PMC free article] [PubMed] [Google Scholar].