IJPSR (2023), Volume 14, Issue 8 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 15 December 2022; received in revised form, 20 February 2023; accepted 29 May 2023; published 01 August 2023

CLINICAL CHARACTERISTICS AND NEONATAL OUTCOMES OF PREGNANT WOMEN WITH COVID-19 IN PUNE, INDIA

Arundhati Galande [1], Paulami Deshmukh [1], Deepa Ingale [1], Pallavi Singh [1], Vinoad Bharrati [* 1], Pawan Salunke [1], Ashish Tapadia [1], Rekha Galande [1], Vaishali Deshmukh [1], Saurav Deka [2] and Nilesh Paul [2]

Rising Medicare Hospital [1], Pune - 411014, Maharashtra, India.
THB c/o Sekhmet Technologies Pvt Ltd. [2], Gurugram - 122001, Haryana, India.

Keywords:

Covid-19 infection, Pregnancy, Coronavirus disease in pregnancy, Neonatal outcomes, Perinatal outcomes

Correspondence to Author:
Dr. Vinoad Bharrati

MBBS, DGO, DNB,
Rising Medicare Hospital,
Pune - 411014, Maharashtra, India.

E-mail: drvinodbharati@gmail.com

ABSTRACT: The clinical features, disease progression, and outcome of Covid-19 in pregnant patients are not entirely understood. Many research studies came with different findings about Covid-19 infection in pregnancy. The present study demonstrates the clinical profile and neonatal outcomes of pregnant women affected by Covid-19. An observational study was conducted in a secondary and tertiary care private hospital, Rising Medicare Hospital in Pune city, Maharashtra. Pregnant women with Covid-19 infection admitted from1st March 2021 to 31st Aug 2021 were followed until they were discharged. After the consent, essential data was collected with the help of installed software. The maternal and feta outcomes and vertical transmission were accessed. A total of twenty-one cases participated in this study. Ten patients (47.62%) had a history of contact with Covid-19 infected patients and 19 (90.48% patients) were discharged with the continuation of pregnancy without any complication. One maternal death occurred due to Covid related complications. Out of five live births, one baby showed vertical transmission. The present study determined the incidence of vertical transmission, course of illness in pregnancy, and maternal and neonatal complications due to Covid infection. There is a need for special precautions to avoid Covid-19 infection during pregnancy.

INTRODUCTION: Covid-19, an emerging disease caused by a novel coronavirus (SARS-COV-2), is a global health emergency [1, 2]. This disease was noticed in December 2019 in Wuhan, China, and rapidly spread worldwide in more than 200 countries [3]. The World Health Organization (WHO) declared this disease a global pandemic on 11 March 2020 [4]. On January 30, 2020, the first case of Covid-19 was registered in India [5].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.14(8).4080-85

This article can be accessed online on www.ijpsr.com

DOI link: http://doi.org/10.13040/IJPSR.0975-8232.14(8).4080-85

In Pune, the first case of the disease was reported on March 9, 2020 [6] and the district ranked first crossing more than two lakh cases. During the initial phase of the disease, mortality due to Covid-19 was also high in Pune compared to the other districts of India [7]. The Covid-19 disease showed various kinds of symptoms about clinical features, including influenza-like symptoms.

The spectrum of Covid-19 is broad as asymptomatic, mild infection to acute respiratory failure, multiorgan distress syndrome, and death. High mortality was seen in patients with comorbidities like hypertension, diabetes, heart diseases, renal compromise, hepatic disorder, and patients on immunosuppressant therapy. Also, respiratory and circulatory changes occurring in

states like pregnancy areat high risk of developing severe disease [8]. So, a state of pregnancy also predisposes a female to Covid-19 infections. The reasons are immunomodulatory changes that occur hemodynamically during pregnancy, a predominant shift of CD4+ T cells towards Th2 phenotype over Th1 cells [9] and reduction in natural killer cell count [10] and plasmacytoid dendritic antigen-presenting cells [11] and increased levels of circulating progesterone which has shown to reduce virus protective CD8+ T cell antibodies in mice [12], to name a few. Hemodynamic disturbances such as hypercoagulability and disturbed endothelial (mainly pulmonary endothelial cell) function have been the possible cause of the increased prevalence of pre-eclampsia in pregnant women affected with Covid-19 [13, 14, 15].

Covid-19 has mainly affected pregnancies after 24 weeks of gestation, causing intrauterine growth restriction, pretermbirths, perinatal mortality, and respiratory distress [16]. The clinical features and disease progression of Covid-19 in pregnant patients are not entirely understood. There were limited reports about disease progression, maternal and neonatal outcomes, and pregnancy complications in Covid-19 infected pregnant women.

It was needed to identify various perspectives like whether pregnancy with Covid-19 develops different features than non-pregnant, the severity of Covid-19 disease increased in the pregnancy state, any risk of preterm or stillbirth or any other neonatal complications, and chances of vertical transmission. This observational study aimed to understand the clinical features, progression, the maternal and neonatal outcomes in pregnancy with Covid-19 infection.

MATERIALS AND METHODS: A multi-centric study was conducted in secondary and tertiary care private hospitals in Pune City, Maharashtra, India. The study was done in collaboration with the Society for Prevention, healthcare, education and Research (SPHERE), an NGO in Pune working for research promotion in healthcare under the supervision of a zonal medical officer, Pune municipal corporation. Pregnant patients with Covid-19 infection admitted to the hospital participated in the study. We followed patients till they were discharged from study hospitals. Written informed consent was obtained from the pregnant patients/relatives (if needed). The data was collected as per the questionnaire designed as software developed by Mobicloud Technologies and installed at all the participating centers. The questionnaire included sections regarding demographic and anthropometric profiles, clinical symptomatology, biochemical assessment, therapeutics, vaccination, maternal and fetal details, and outcomes of Covid-19 affected patients. Missing information was collected on the phone or messages or e-mails from the patient, relatives, or treating doctors if the patient was not physically available. All routine Antenatal care hematological and ultrasound examinations were done on the admission of patients. The inflammatory marker tests and other tests based on the clinical ground of the patient were done.

Inclusion Criteria: Admitted pregnant patients with Covid-19 infection confirmed by nasopharyngeal or pharyngeal swab either by rapid antigen test (RAT) or reverse transcription-polymerase chain reaction (RT-PCR) test from 1st March 2021 to 30th June 2021.

Ethical Considerations: Ethical clearance for the study was obtained from Rising Medicare Hospital and Research Center, Pune, registered independent ethics committee (Registration number: ECR/1578/Inst/MH/2021). All participants were informed about the study objectives and their right to participate. Study participants 'information was kept confidential and used for research purposes only.

Statistical Analysis: Statistical analysis was done using SPSS v20.0. Quantitative variables were analyzed as median with interquartile range (IQR) for skewed data and mean ± SD for data with normal distribution. Qualitative variables were organized as a total number with percentages. The Chi-square test was used for categorical variables.

RESULTS: Twenty-one Covid-19-infected pregnant women, irrespective of gestational age, participated in the study. The mean age of patients was 29.33 years, with a standard deviation of 4.80. The range of maternal age was 23 to 41 years.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF PATIENTS

Variables		Frequency (N= 21)	Percentage (%)
Maternal age (years)	20-25	7	33.33
	26-30	6	28.57
	31-35	6	28.57
	>35	2	9.53
Gestational age	1-12 weeks (1st trimester)	2	9.52
	13-26 weeks (2nd trimester)	7	33.33
	>26 weeks (3rd trimester)	12	57.15
Comorbidities	DM	2	9.53
	HTN	4	19.06
	Asthma	0	0
	COPD	0	0
	IHD	0	0
	Thyroid	1	4.76
	Epilepsy	1	4.76
Gravida	Gravida 1	9	42.85
	Gravida 2	7	33.33
	Gravida 3	3	14.29
	Gravida 4	2	9.53
Parity	Primiparous	9	42.85
	Multiparous	12	57.15
Abortion history	No	12	57.15
	1	7	33.33
	2	2	9.52
BCG vaccination	Yes	21	100
	No	0	0
Covid Vaccination (single/double dose)	Yes	10	47.62
	No	11	52.38
Covid patient contact	Yes	10	47.62
	No	11	52.38

DM-Diabetes Mellitus, HTN-Hypertension, COPD-Chronic obstructive pulmonary disease, IHD- Ischemic heart disease.

Fig. 1 shows age wise distribution of participating patients according to various age groups. In our study, maximum number of patients was observed in the age of 20 to 25 years as 7 (33.33%) patients.

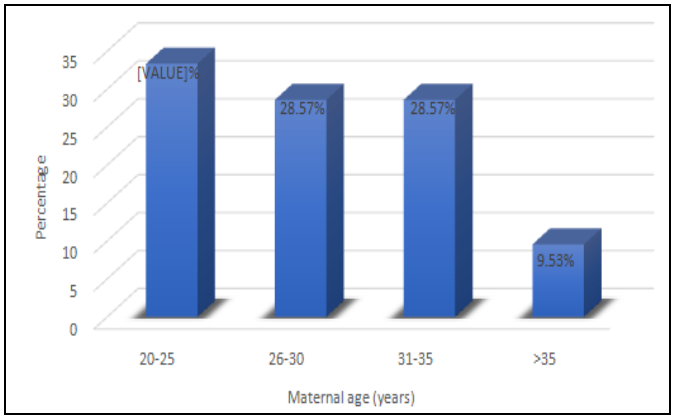

FIG. 1: AGE-WISE DISTRIBUTION OF Covid-19-POSITIVE PREGNANT PATIENTS

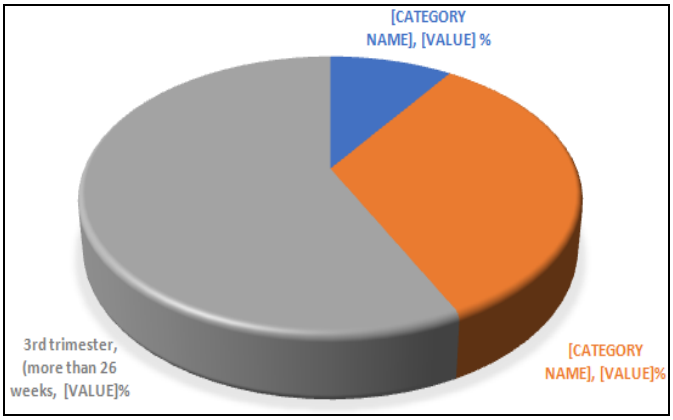

FIG. 2: GESTATION AGE-WISE DISTRIBUTION OF Covid-19 POSITIVE PREGNANT PATIENTS

There were nine patients (42.85%) with primigravida **Table 1**. The number of patients with multiparous was as high as 12 (57.15%) compared to primiparous patients. Third-trimester pregnancy cases were affected more as 57.15% compared to patients in the first and second trimesters. **Fig. 2** represents the gestational-age-wise distribution of the study patients. Twelve (57.15%) patients had no history of abortion, while two patients (9.52%) had two abortions before their present pregnancy. Regarding comorbidities 4 (19.06%) pregnant patients had hypertension, while 2 (9.53%) patients were known cases of type 2 diabetes. All comorbid patients were on regular treatment.

All the participants had BCG vaccination in childhood, confirmed by a post-vaccine scar on the left deltoid examination. Regarding the Covid vaccination status of participants, 47.62% of patients have taken a single shot of the Covid vaccine. Ten patients (47.62%) had a contact history with Covid-19 infected patients.

TABLE 2: DISTRIBUTION OF PATIENTS BASED ON SYMPTOMS OF Covid-19 INFECTIONS AND DURATION

Symptoms	Duration, N=21 (%)	
	1 to 4 days	>4 days
Cough	10 (47.6)	3 (14.3)
Fever	11 (52.4)	3 (14.3)
Cold	2 (9.5)	-
Throat pain	1 (4.8)	-
Breathlessness	1(4.8)	1 (4.8)
Weakness	6 (28.6)	-
Nausea	3 (14.3)	1 (4.8)
Loss of appetite	1 (4.8)	-
Loose motion	1 (4.8)	-
Body ache	5 (23.8)	-

The presence of intolerable symptoms always works as a driving force for the patients seeking health care services. Covid-19 has shown various symptoms ranging from asymptomatic to severe forms of the disease. In our study, the most predominant clinical symptom was observed as fever. Eleven (52.4%) patients complained of fever for 1 to 4 days while in 3 (14.3%) patients it lasted between 5 to 9 days **Table 2**. Following the fever, the cough was a significant complaint. Weakness was reported in 28.6% of patients. Other complaints were body aches, cold, throat pain, nausea, loss of appetite, loose motion, and breathlessness. Surprisingly, we had no patients complaining of loss of taste or smell.

TABLE 3: MATERNAL AND FETAL OUTCOME AT THE TIME OF DISCHARGE

	Frequency (N=21)	Percentage (%)
Maternal outcome		
Discharged	19	90.48
Transferred to other hospital	1	4.76
Death	1	4.76
Total	21	100
Fetal outcome		
Pregnancy continued without complication	14	66.66
Live births	5	23.82
Fetal death (MTP / Abortion)	2	9.52
Stillbirth	0	0
Total	21	100

Among 21 admitted Covid-19 infected patients, 19 (90.48%) patients were discharged without any maternal complication with continuation pregnancy as they were not full-term pregnancies. One patient (4.76%) transferred to another hospital while one death occurred due to Covid complications **Table 3.** The fetal outcome was recorded as a continuation of pregnancy with or without any complication. Fourteen (66.66 %) cases were continued as pregnancy without any complications. Also, 5 (23.82%) babies were delivered as live born by the Lower segment caesarian section (LSCS). Two deaths occurred due to medical termination of pregnancy due to chromosomal abnormalities, and another was missed abortion.

DISCUSSION: Many research studies revealed that advanced maternal age has adverse obstetrical outcomes such as pregnancy-induced hypertension, antepartum hemorrhage, and cesarean delivery and is increasingly associated with adverse perinatal outcomes like preterm delivery, low birth weight, and perinatal death (adv age ref). In this hospital-based prospective study, the mean maternal age (years) with standard deviation was 29.33±4.80. The maximum number of 33.33% of pregnant patients was young, from 20 to 25 years. These findings were like other studies conducted in the USA [17] and in Wuhan, China [18]. Patients with Covid-19 infection who suffer from comorbidities like hypertension, ischemic heart diseases, chronic kidney diseases, respiratory illnesses and diabetes mellitus are more likely to develop a more severe course and progression of the disease [19]. In our study, 19.06% of pregnant patients had a history of hypertension. Also, two patients (9.53%) suffered from diabetes, thyroid disorder, and epilepsy. A similar finding was noted in a study by Xu Qiancheng *et al*.

Regarding the gravida of studied patients, the primigravida patients were more (42.85%) than other gravida groups. In the case of gestational age, the maximum number of patients was in the third trimester. In the study by *C. brinda* Priyadharshini [20], the maximum number of cases of Covid-19 infection was in the third trimester. It might be due to intensive screening nearing the expected date of delivery. Regarding vaccination status, some research studies stated that the countries with BCG vaccination in national immunization programs

have fewer covid-19 cases and deaths per population, possibly due to the trained immunity [21]. In this study, we have found that all cases (100%) have taken BCG vaccination in childhood as BCG vaccination immediately after birth is included in the Universal immunization program conducted in India. Covid-19 infection during pregnancy may result in rapid deterioration of the health of pregnant women and could also affect the fetus. The government of India started the Covid vaccination program in July 2021. In this study, 47.62% of pregnant patients had a history of Covid vaccination. Though the general population is vaccinated at a high rate in India, there is still some stigma or misconception in Indian society.

Our study found that fever and cough were the most prominent features at 47.6% and 52.4%, respectively. Body weakness was also found in a significant number of patients (28.6%). Abdollahpour *et al.* found that the main symptoms of pregnant women with Covid-19 were fever and cough [22]. Also, the same finding was seen as cough, fever, and weakness were prominent features of pregnant with Covid-19 infection in a study done by Akhtar *et al*. [23]. The maternal outcome was noted as a continuation of pregnancy, delivered safely either by lower segment cesarean section or vaginal delivery, medical termination of pregnancy, preterm labor and missed abortion. Brinda *et al.* [20] in Madurai, Tamil Nadu, reported that 0.8% of maternal deaths and 99.2% of pregnant Covid-19-infected patients were discharged.

In our study, among 21 admitted Covid-19 infected patients, 19 (90.48%) were discharged without any maternal complication with continuation pregnancy as they were not full-term pregnancies. No preterm delivery was noted in our study. One patient was (4.76%) transferred to another hospital. Also, one maternal death occurred due to Covid complications. The role of vertical transmission of Covid-19 infection is still unclear. The study by Huntley et al 24 noted no vertical transmission case among 310 deliveries for which RT-PCR data were available. The study by Kasraeian et al.25 found no evidence of vertical transmission was suggested, at least in late pregnancy. No hazards have been detected for fetuses or neonates**.** The study done by Gordon *et al.* [26] reported only three (30%) are likely to be vertically transmitted. At the same time, seven occurred in the post-perinatal period and are likely to have been postnatally acquired. In our study, among five live births born babies, four babies (80%) were Covid negative; one baby (20%) was found Covid-19 infected by confirmed by RT-PCR. As Covid-19 is a highly infectious disease, the secondary attack rate of Covid-19 is higher than other infectious diseases. In the studied city, overall SAR was estimated to be 32.5%, 33.7% among the high-risk contacts and 13.3% among the low-risk contacts. In our study, 47.62% of patients had a contact history with Covid-19 patients. There are some limitations of this study. We had limited patients' data to interpret or conclude the results. Most of the patients were presented with a mild or moderate type of Covid-19 illness, leading to limited interpretation of results. The chances of selection bias also couldn't ignore. Also, we followed up with patients until their hospital discharge. There were 66.66% of patients yet to deliver, so we could not comment on the long-term effect of Covid infection.

CONCLUSION: In this hospital-based observational study, Covid-19 infected pregnant patients, the majority of patients had a good outcome. Nevertheless, one maternal death due to Covid related complications could not ignore. In the case of vertical transmission, the positivity of infection in one in five neonates supports some evidence of vertical transmission to some extent. However, more longitudinal studies are needed on a large scale to determine the incidence of vertical transmission, course of illness in pregnancy, and maternal and neonatal complications due to Covid infection. There is also a need for special precautions to avoid Covid-19 infection during pregnancy.

ACKNOWLEDGMENT: The authors are thankful to the society for prevention, healthcare, education, and research (SPHERE) for the provision of funding.

Ethical Statement: All the procedures followed in the study were in accordance with the institution's ethical standards. The institution's ethical committee had critically evaluated the study and approved it.

CONFLICTS OF INTEREST: None

REFERENCES:

1. Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN and Tamin A: Aerosol and surface stability of SARS CoV-2 as compared with SARS-CoV-1. N Engl J Med 2020; 382: 1564-7.
2. Xu Y, Li X, Zhu B, Liang H, Fang C, Gong Y and Guo Q: Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. Nat Med 2020; 26: 502-5.
3. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J and Zhao X: A novel coronavirus from patients with pneumonia in China 2019. N Engl J Med 2020; 382: 727-33.
4. Rolling updates on corona virus disease (Covid-19).Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events.Accessed on 01 January 2022.
5. Ministry of health and family welfare, Government of India. Covid-19 state wise status. Available from:https://www.mohfw.gov.in/. Accessed on 05 November 2021.
6. Maharashtra Covid-19 dashboard. Available from:https://arogya.maharashtra.gov.in/
7. Time of India news article. Available from: http://timesofindia.indiatimes.com/articleshow/75364064.cms?utm_source=contentofinterest and utm_medium=text and utm_campaign=cppst.
8. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS and Jamieson DJ: Coronavirus Disease 2019 (Covid-19) and pregnancy: what obstetricians need to know. Am J Obstet Gynecol 2020; 222: 415-26.
9. Piccinni MP and Romagnani S: Regulation of fetal allograft survival by a hormone-controlled Th1- and Th2-type cytokines. Immunol Res 1996; 15: 141-50.
10. Veenstra van Nieuwenhoven AL, Heineman MJ and Faas MM: The immunology of successful pregnancy. Hum Reprod Update 2003; 9: 347-57.
11. Vanders RL, Gibson PG, Murphy VE and Wark PA: Plasmacytoid dendritic cells and CD8 T cells from pregnant women show altered phenotype and function following H1N1/09 infection. J Infect Dis 2013; 208: 1062-70.
12. Hall OJ, Nachbagauer R, Vermillion MS, Fink AL, Phuong V, Krammer F and Klein SL: Progesterone-Based Contraceptives Reduce Adaptive Immune Responses and Protection against Sequential Influenza A Virus Infections. J Virol 2017; 91: 02160-16.
13. Di Renzo GC and Giardina I: Coronavirus disease 2019 in pregnancy: consider thromboembolic disorders and thromboprophylaxis. Am J Obste Gynecol 2020; 223: 135.
14. Varga Z, Flammer AJ, Steiger P, Haberecker M, Andermatt R, Zinkernagel AS and Mehra MR: Endothelial cell infection and endotheliitis in Covid-19. Lancet 2020; 395: 1417-8.
15. Di Mascio D, Khalil A, Saccone G, Rizzo G, Buca D, Liberati M and Vecchiet J: Outcome of coronavirus spectrum infections (SARS, MERS, Covid-19) during pregnancy: a systematic review and meta-analysis. Am J Obstet Gynecol MFM 2020; 2: 100107.
16. Mosby LG, Rasmussen SA and Jamieson DJ: 2009 pandemic influenza A (H1N1) in pregnancy: a systematic review of the literature. Am J Obstet Gynecol 2011; 205: 10-8.
17. Lokken EM, Walker CL, Delaney S, Kachikis A, Kretzer NM, Erickson A and Resnick R: Clinical characteristics of 46 pregnant women with a severe acute respiratory syndrome coronavirus 2 infection in Washington State. Am J Obstet Gynecol 2020; 223(6): 911-1-914.
18. Qiancheng X, Jian S, Lingling P, Lei H, Xiaogan J, Weihua L and Gang Y: Coronavirus disease 2019 in pregnancy. Int J Infect Dis 2020; 95: 376-383.
19. Adekunle S, Chuku O, Aleksandra M, Risha P, Kokab Y, Priyank D and Zaheeda H: Comorbidity and its Impact on Patients with Covid-19. SN Compr Clin Med 2020; 2(8): 1069-76.
20. Priyadharshini CB, Priya S, Selvameena M, Waseemsha S, Muthurajesh E and Shalini M: Demographic profile of Covid-19 positive mothers & their outcome in government Rajaji hospital, Madurai, Tamilnadu - A cross sectional Study. Clin Epidemiol Glob Health 2021; 12: 100864.
21. Gursel M and Gursel I: Is global BCG vaccination-induced trained immunity relevant to the progression of SARS-CoV-2 pandemic? Allergy 2020; 75: 1815-1819.
22. Abdollahpour S and Khadivzadeh T: Improving the quality of care in pregnancy and childbirth with coronavirus (Covid-19): a systematic review. J Matern Fetal Neonatal Med 2022; 35: 1601-9.
23. Akhtar H, Patel C, Abuelgasim E and Harky A: Covid-19 (SARS-CoV-2) Infection in Pregnancy: A Systematic Review. Gynecol Obstet Invest 2020; 85: 295-306.
24. Huntley BJF, Huntley ES, Di Mascio D, Chen T, Berghella V and Chauhan SP: Rates of Maternal and Perinatal Mortality and Vertical Transmission in Pregnancies Complicated by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Co-V-2) Infection: A Systematic Review. Obstet Gynecol 2020; 136: 303-12.
25. Kasraeian M, Zare M, Vafaei H, Asadi N, Faraji A, Bazrafshan K and Roozmeh S: Covid-19 pneumonia and pregnancy; a systematic review and meta-analysis. J Matern Fetal Neonatal Med 2022; 35: 1652-9.
26. Gordon M, Kagalwala T, Rezk K, Rawlingson C, Ahmed MI and Guleri A: Rapid systematic review of neonatal Covid-19 including a case of presumed vertical transmission. BMJ Paedia Open 2020; 4: 000718.

How to cite this article:
Galande A, Deshmukh P, Ingale D, Singh P, Bharrati V, Salunke P, Tapadia A, Galande R, Deshmukh V, Deka S and Paul N: Clinical characteristics and neonatal outcomes of pregnant women with Covid-19 in Pune, India. Int J Pharm Sci & Res 2023; 14(8): 4080-85. doi: 10.13040/IJPSR.0975-8232.14(8).4080-85.