



TO STUDY CLINICAL PROFILE AND OUTCOME IN PREGNANT WOMEN WITH INFECTIOUS DISEASES REQUIRING ADMISSION IN MEDICAL WARDS AND MEDICAL INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL

General Medicine

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ABSTRACT

Background: As compared to non-pregnant women, pregnant women are more severely affected by infections with some organisms including influenza virus, hepatitis E virus, herpes simplex virus, & malaria. The threshold for diagnostic evaluation, as well as hospitalisation and treatment, may be lower for pregnant patients than for other patients. Present research was conducted to study the clinical profile and outcome of pregnant women with infectious diseases requiring admission in a tertiary care hospital. **Methodology:** The observational Study was conducted on 265 Pregnant women suffering from infectious diseases or with chronic infectious diseases like hepatitis B, HIV if develops any acute complication requiring admission. Detailed history, past medical or surgical history noted. Baseline investigations, USG and MRI if applicable were done. End Point was discharge or death, whichever occurred first. Chi Square test was used to obtain correlation between infectious diseases, maternal and fetal outcome with clinical profile of participants. **Results:** Out of 265 patients, 60% patients were multigravida and 65.66% were in third trimester of pregnancy. Majority (96%) were discharged. Around 1.5% had IUFD; 35% Full term deliveries; 8% had preterm deliveries; 0.38% had abortion. Complications were higher in multigravida (3.14%) as compared to 2.86% in primigravida. Meningitis, Sepsis had statistically significant association with maternal outcome (death) (p value<0.01). Fetal complications (15%) were more common in elderly age group and in primigravida. Fetal complications had statistically significant association with 3rd trimester of pregnancy, sepsis and covid-19. (p value-0.003). **Conclusion:** Infectious diseases are very common in Pregnancy as there are immunological alterations, increasing the susceptibility to various infections. Meningitis and sepsis had statistically significant association with maternal mortality. Early diagnosis and prompt management of meningitis and sepsis will prevent maternal morbidity and mortality. Fetal complications had statistically significant association with in 3rd trimester of pregnancy, sepsis and covid 19 infection. Regular ANC visits with fetal monitoring especially in later trimesters will prevent fetal complications.

KEYWORDS

Clinical Profile, Infectious Diseases, Covid 19, Hepatitis E infection.

INTRODUCTION

As compared to non-pregnant women, pregnant women are more severely affected by infections with some organisms including influenza virus, hepatitis E virus, herpes simplex virus, & malaria. The influenza pandemic of 2009 provided more recent evidence that certain infections may disproportionately affect pregnant women⁽¹⁾. Pregnant women are at increased risk for severe illness from influenza virus infection. During the 2009 H1N1 pandemic, as well as during interpandemic periods, women in the third trimester of pregnancy were at increased risk for severe disease (e.g., disease requiring admission to an intensive care unit or resulting in death), as compared with women in an earlier stage of pregnancy^(2,3). Infection with HEV is also more severe in pregnant women, with high mortality during the third trimester. In a case series from India, 33 to 43% of pregnant women with HEV infection had severe disease or infection that led to fulminant hepatic failure⁽⁴⁾.

The severity of *Plasmodium falciparum* malaria is determined by the level of immunity, which depends mainly on the intensity and stability of malaria transmission. In three districts in India, 23% or more of maternal deaths between 2004 and 2006 were attributable to malaria, which was the most common cause of maternal death during pregnancy⁽⁵⁾. Pregnant women have a risk of severe malaria that is three times as high as that among nonpregnant women; a median maternal mortality of 39% has been reported in studies in the Asia-Pacific region⁽⁶⁾. Maternal death also has been reported in association with *P. vivax* infection. In areas of high transmission, most women harbouring parasites do not present with symptoms⁽⁷⁾. Early studies postulated that pregnancy, particularly in the third trimester, is a risk factor for severe varicella.

The threshold for diagnostic evaluation, as well as hospitalisation and treatment, may be lower for pregnant patients than for other patients. We are describing here important infections for which pregnant women are susceptible.

OBJECTIVES:

1. To study the clinical profile of pregnant women with infectious

diseases requiring admission in tertiary care hospital.

2. To study the pregnancy outcome in the study population like premature termination of pregnancy, IUFD, normal course of pregnancy without adverse event.

MATERIALS AND METHODS:

The Observational Prospective Study was conducted at Medical Wards & M.I.C.U of a Tertiary Care Hospital between (December 2018- June 2020) on 265 Pregnant Women suffering from infectious diseases or with chronic infectious diseases like hepatitis B, HIV if develops any acute complications requiring admission in medical wards & M.I.C.U. of a tertiary care hospital. Patients with infections developing in postpartum period like puerperal sepsis were excluded.

Detailed history of patient's clinical manifestations, obstetric history, past medical or surgical history noted. Baseline investigations e.g. CBC, LFT, RFT, Fever profile, Urine analysis. USG for fetal viability and MRI if applicable was done. End Point: Discharge or Death, whichever occurred first.

Statistical Analysis:

Logistic regression test was used to analyse the correlation between the various infectious diseases and the outcomes of pregnancy as well as the effects of pregnancy on diseases. Chi Square test was used on the data to obtain the correlation between infectious diseases, maternal outcome and fetal outcome with the clinical profile of the participants.

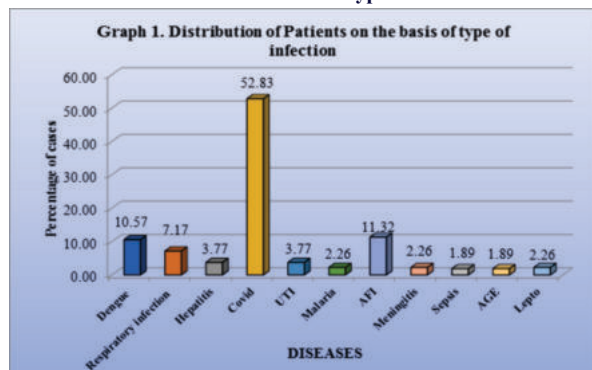
RESULTS AND ANALYSIS:

Baseline characteristics of the patients:

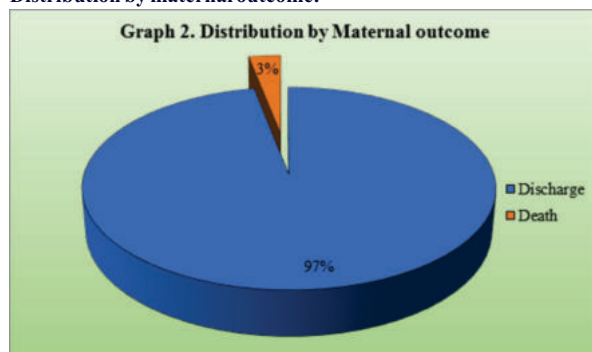
The minimum age of participant was 18 years and the maximum age was 39 years. Out of 265 patients, 198 patients (74.72%) were in age group of 21-30 years and 52 patients (19.62%) were older than 30 years age. 106 patients (40%) were Primigravida and 159 patients (60%) were multigravida. 40 patients (15.09%) were in first trimester; 51 patients (19.25%) were in second trimester; 174 patients (65.66%) were in third trimester.

Table 1. Age distribution of patients:

Patient variables		Frequency	Percentage
Age (Years)	<20	15	5.66%
	21-30	198	74.72%
	>30	52	19.62%
Gravida	1	106	40%
	2	85	32.08%
	3	56	21.13%
	> 3	18	6.79%
Trimester	1	40	15.09%
	2	51	19.25%
	3	174	65.66%
Total	265	100%	

Distribution of Patients on the basis of type of infection

140 patients (52.83%) had covid-19 infection; 30 patients (11.32%) had acute febrile illness; 28 patients (10.57%) had Dengue infection; 19 patients (7.17%) had respiratory infections; 10 patients (3.77%) each of hepatitis and urinary tract infections.

Distribution by maternal outcome:

In this study, most of the patients were discharged without any adverse outcome to pregnancy or fetus. 257 patients (96.98%) were discharged and 8 patients (3.02%) died. Out of 8 patients, 1 patient died due to sepsis in case of lower respiratory tract infection, 2 patients died due to meningitis with altered sensorium, 2 patients died due to ARDS in case of dengue infection, 1 patient died due to dengue encephalitis with acute hypernatremia, 1 patient died due to sepsis with disseminated intravascular coagulopathy, 1 patient died due to status epilepticus with acute liver failure and sepsis.

Table 2. Distribution by fetal outcomes:

Fetal outcomes and Causes of Death	Frequency	Percentage
Fetal outcome		
Uneventful*	142	53.58%
IUFD	4	1.51%
Preterm Delivery	23	8.68%
Full term Delivery	95	35.85%
Abortion	1	0.38%

*- Patient discharged while being pregnant without any fetal complications.

142 patients (53.58%) were discharged without any adverse fetal outcome; there was 4 (1.51%) IUFD; 23 (8.68%) Preterm deliveries; 95 (35.85%) Full term deliveries; 1 (0.38%) abortion; 4 Twin gestations.

Table 3. Co-relation of maternal outcome with various parameters

Maternal Factors		Maternal outcome		Total	Chi-square, P-value
		Discharge	Death		
Age Group	<20	18(94.74%)	1(5.26%)	19(100%)	0.543,
	21-30	188(96.91%)	6(3.09%)	194(100%)	0.764
	>30	51(98.08%)	1(1.92%)	52(100%)	
Gravida	1	103(97.17)	3(2.83%)	106(100%)	0.566,
	2	83(96.92%)	2(3.08%)	85(100%)	0.867
	3	54(96.43%)	2(3.57%)	56(100%)	
	>3(4-6)	18(100%)	0(0.0%)	18(100%)	
Trimester	I	38(95%)	2(5%)	40(100%)	2.961,
	II	48(94.12%)	3(5.88%)	51(100%)	0.228
	III	171(98.28%)	3(1.72%)	174(100%)	
Disease / Infection	Dengue	26(92.86%)	2(7.14%)	28(100%)	0.202
	Respiratory	18(94.74%)	1(5.26%)	19(100%)	0.568
	Hepatitis	10(100%)	0(0%)	10(100%)	0.577
	Covid	140(100%)	0(0%)	140(100%)	0.037
	UTI	10(100%)	0(0%)	10(100%)	0.577
	Malaria	6(100%)	0(0%)	6(100%)	0.666
	AFI	29(96.67%)	1(3.33%)	30(100%)	0.92
	Meningitis	4(66.67%)	2(33.33%)	6(100%)	0.000014
	Sepsis	3(60%)	2(40%)	5(100%)	0.0000013
	AGE	5(100%)	0(0%)	5(100%)	0.693
	Leptospirosis	6(100%)	0(0%)	6(100%)	0.666
Total		257(96.98%)	8(3.02%)	265(100%)	

No Statistically Significant association could be attributed to the maternal outcome in relation to the age. 19 patients were younger than 20 years out of which 18 patients (94.74%) were discharged and 1 patient died due to status epilepticus with sepsis with acute liver failure.

194 patients were in age group of 21-30 years, out of which 188 patients (96.91%) were discharged and 6 patients (3.09%) were died. Out of 6 patients, 2 patients died due to meningitis with altered sensorium, 2 patients died due to ARDS in case of Dengue infection, 1 patient died due to Dengue encephalitis with acute hypernatremia, 1 patient died due to sepsis with lower respiratory tract infection. 52 patients were older than 30 years, out of which 51 patients (98.08%) were healthy and discharged and 1 patient (1.92%) died due to sepsis with disseminated intravascular coagulopathy. P value is 0.764. No maternal death was associated with covid 19 infection.

No Statistically significant association could be attributed to maternal outcome in relation to gravida. Out of 106 patients of Primigravida, 103 patients (97.17%) were discharged and 3 died. Out of 85 patients of gravida 2, 83 patients (96.92%) were discharged and 2 died. Out of 56 patients of gravida 3, 54 patients (96.43%) were discharged and 2 died. So, the risk of maternal complications is more with successive pregnancies. No statistically significant association found to maternal outcome in relation to trimester of pregnancy. Using Chi-square test, P value is 0.228 (table 3).

Co-relation Of Fetal Complication With Various Parameters:

Though correlation between fetal complications with maternal Age statistically not significant, elderly mothers (>30 years) had more fetal complications. Out of 106 primigravida patients, only 12 patients (11.32%) had fetal complications. Out of 85 patients of Gravida 2, only 7 patients (8.24%) had fetal complications. Out of 56 patients of Gravida 3, only 7 patients (12.50%) had fetal complications. Out of 18 patients of more than 3 Gravida (4-6), only 2 patients (11.11%) had fetal complications. Using Chi-square test, P value is 0.854 (table 4).

Out of total 29, 27 (15.52%) fetal complications were present in third trimester, while 2 (5%) fetal complications were seen in 1st trimester. Using Chi-square test, P value is 0.003. Fetal outcome has statistically significant association with trimester of pregnancy; more complications in later trimester. Co-relation of fetal outcome with type of infection: Out of 28 dengue cases, 2 cases (7.14%) had fetal complication. P value 0.519.

Out of 19 respiratory infection cases, 1 (5.26%) had fetal complications. P value - 0.428. None of the 10 cases of hepatitis had fetal complications. P value is 0.267. Out of 140 cases of covid-19, 23 (16.43%) had fetal complications. P value is 0.038. covid-19 had statistically significant correlation on fetal outcome.

None of the 10 cases of urinary tract infection had fetal complications. P value is 0.268. None of the 6 cases of malaria had fetal complications. P value is 0.391. None of the 6 cases of meningitis had fetal complications. P value is 0.391. Out of 5 cases of sepsis, 3 cases (60%) had fetal complications. P value is 0.0004. Sepsis had statistically significant association on fetal outcome. So early treatment of sepsis will prevent adverse fetal outcome.

Table 4. Co-relation of fetal complication with various parameters:

Maternal Factors	Fetal Complication		Total	Chi Square, P value
	Present	Absent		
Age group	<20	2(13.33%)	13(86.67%)	1.86,
	21-30	18(9.09%)	180(90.91%)	0.40
	>30	8(15.38%)	44(84.62%)	52(100%)
Gravida	1	12(11.32%)	94(88.68%)	106(100%)
	2	7(8.24%)	78(91.76%)	85(100%)
	3	7(12.50%)	49(87.50%)	56(100%)
	>3(4-6)	2(11.11%)	16(88.89%)	18(100%)
Trimester	I	2(5%)	38(95%)	40(100%)
	II	0(0%)	51(100%)	51(100%)
	III	27(15.52%)	147(84.48%)	174(100%)
Disease / Infections	Dengue	2(7.14%)	26(92.86%)	28(100%)
	Respiratory	1(5.26%)	18(94.74%)	19(100%)
	Hepatitis	0(0%)	10(100%)	10(100%)
	Covid	23(16.43%)	117(83.57%)	140(100%)
	UTI	0(0%)	10(100%)	10(100%)
	Malaria	0(0%)	6(100%)	6(100%)
	AFI	0(0%)	30(100%)	30(100%)
	Meningitis	0(0%)	6(100%)	6(100%)
	Sepsis	3(60%)	2(40%)	5(100%)
	AGE	0(0%)	5(100%)	5(100%)
	Leptospirosis	0(0%)	6(100%)	6(100%)
	Total	29(10.94%)	236(89.06%)	265(100%)

None of the 5 cases of acute gastroenteritis had fetal complications. P value is 0.433. None of the 6 cases of leptospirosis had fetal complications. P value is 0.391.

DISCUSSION:

Total 265 pregnant patients with infectious diseases were recruited for the study after taking informed consent. Infections were the underlying cause of most of the deaths recorded during the study, primarily post-abortion infection and indirect infections. This suggests that the contribution of infection to global maternal mortality and morbidity may be larger.

Present study shows out of 28 patients of Dengue, 26 patients (92.86%) were discharged. P value-0.20. **Machado et al⁽⁸⁾** found an increase in severe dengue in pregnant women in Brazil during the second and third trimesters. In our study also, adverse pregnancy complications were found more in second trimester. Out of 19 patients of Respiratory tract infections, 18 patients (94.74%) were discharged. P value-0.568.

A review of the available data suggests that the prevalence of active TB among pregnant women ranges from 0.06% to 0.25% in low-burden countries. In high-burden countries, rates of between 0.07% and 0.5% were found among HIV-negative women, and between 0.7% and 11% among HIV-positive women⁽⁹⁾ South African study detected TB in 9% of infants born to mothers with active TB, and found maternal TB to be strongly associated with both maternal and neonatal mortality. Studies from South Asia⁽¹⁰⁾ have linked TB during pregnancy to poor perinatal outcomes, including low birth weight, small-for-gestational age, and perinatal mortality, and also maternal morbidity and mortality. Even in low-burden countries such as the UK, where TB during pregnancy is much less prevalent (62/100 000 pregnancies), it is still associated with low birth weight⁽¹¹⁾.

We observed that all 10 patients of hepatitis were discharged. P value-0.577 and all 140 patients of Covid-19 were discharged. P value-0.037. In a study by **Chen et al⁽¹²⁾** 9 women diagnosed with COVID-19 during the third trimester of pregnancy were reported. In this small series, clinical presentation was similar to that seen in nonpregnant adults, with fever in 7, cough in 4, myalgia in 3, and sore throat and malaise each in 2 women. Five had lymphopenia. All had pneumonia, but none required mechanical ventilation, and none died. All women had a

cesarean delivery, and Apgar scores were 8–9 at 1 minute and 9–10 at 5 minutes.

In a second series of 9 pregnancies with 10 infants (1 set of twins) reported by **Zhu et al⁽¹³⁾** symptom onset was before delivery (1–6 days) in 4, on the day of delivery in 2, and after delivery (1–3 days) in 3 cases. Clinical presentation of COVID-19 was similar to that seen in nonpregnant patients. Among the 9 pregnancies, intrauterine fetal distress was noted in 6, 7 were cesarean deliveries, and 6 infants were born preterm. Based on these limited reports and the available data from other respiratory pathogens such as SARS and influenza, it is unknown whether pregnant women with COVID-19 will experience more severe disease

As per **various studies⁽¹⁴⁾** the incidences of fever and cough in pregnant women with COVID-19 (51, 31%) were lower than those in normal people (91, 67%), which may be due to the changes in the immune system of pregnant women, and further research is needed. The available data do not show increased or even lower maternal mortality rate after infection, which does not indicate that pregnancy is a protective factor for severe infection. It was reported that severe infection mostly occurred in the elderly (>60 years old), patients with co-morbidities such as diabetes, obesity hypertension, coronary heart disease, cerebrovascular diseases, and other chronic diseases⁽¹⁵⁾, as well as those who did not receive timely treatment or delay treatment. Pregnant women are usually younger without primary diseases. Also, pregnant women are usually more likely to receive attention after the onset of the disease, with fewer delays in treatment which can explain the low fatality rate of infected pregnant women. The study showed no statistical differences in clinical features such as respiratory symptoms and fever between pregnant and non-pregnant patients. **Desmond Sutton et al⁽¹⁶⁾** showed that of the 215 pregnant women, 29 (87.9%) of the 33 patients who were positive for SARS-CoV-2 testing had no symptoms of COVID-19 at the time of admission. **Yan et al⁽¹⁷⁾** confirmed that the current mortality rate of COVID-19(2%) is significantly lower than that of SARS (9.6%), which indicate that SARS is more pathogenic and lethal than COVID-19; thus, pregnant women with COVID-19 infection had better outcomes than those with SARS-CoV. Our study also found no adverse outcomes to pregnant patients infected with covid-19

All 10 patients of Urinary Tract Infections were discharged. P value-0.577. Our study is consistent with study carried out by **Kant et al⁽¹⁸⁾** showing that the burden of UTI among pregnant women coming to the antenatal clinic of a subdistrict hospital was considerable, more so among those with symptoms of UTI. All 6 patients of Malaria were discharged. P value-0.666. Out of 30 patients, 29 patients (96.67%) of acute febrile illness were discharged. P value-0.92.

Out of 6 patients, 4 patients (66.67%) of Meningitis were discharged. P value-0.000014. Meningitis had statistically significant association on maternal outcome. So early diagnosis and management of meningitis will improve maternal outcome. **Adriani et al⁽¹⁹⁾** found that pneumococcal meningitis were more common in first trimester of pregnancy and had adverse outcome on both mother and fetus as consistent with our study.

Out of 5 patients, 3 patients (60%) of Sepsis were discharged. P value-0.0000013. sepsis had statistically significant association on maternal outcome. So early treatment of sepsis will prevent maternal morbidity and mortality. **Canales S et al⁽²⁰⁾** and **Albright et al⁽²¹⁾** found that maternal sepsis is significant cause of maternal morbidity and mortality. This is consistent with our study.

All 5 patients of Acute Gastroenteritis were discharged. P value-0.693. All 6 patients of Leptospirosis were discharged. P value-0.666. Correlation of fetal complications with maternal Age: Out of 15 patients younger than 20 years, 13 patients (86.67%) had no fetal complications. Out of 198 patients in age group of 21-30years, 180 patients (90.91%) had no fetal complications. Out of 52 patients older than 30 years, 44 patients (84.62%) had no fetal complications. Using Chi-square test, P value is 0.40. Though statistically not significant, elderly mothers (>30 years) had more fetal complications.

Maheri et al⁽²²⁾ found that maternal age has a significant association with preterm delivery, low birth weight, low fifth minute Apgar score, and perinatal death. In this study, advanced age mothers were almost four times more likely to have premature babies than adult mothers.

This is consistent with our study showing higher fetal complications in mothers with advanced age.

Fetal complications were not significantly associated with Gravida of Pregnancy (P value is 0.854).

Co-relation of fetal outcome and trimester of pregnancy: Out of total 29, 27 (15.52%) fetal complications were present in third trimester, while 2 (5%) fetal complications were seen in 1st trimester (p value is 0.003). Fetal outcome has statistically significant association with trimester of pregnancy; more complications in later trimester. Out of 28 dengue cases, 2 cases (7.14%) had fetal complication. P value 0.519. **Paxaio et al⁽²³⁾** reported fetal and neonatal complications like miscarriage, stillbirth, premature delivery, low birthweight and perinatal infection consistent with our study showing approximately 7% fetal complications in pregnant patients infected with dengue.

Out of 19 respiratory infection cases, 1 (5.26%) had fetal complications. P value - 0.428. None of the 10 cases of hepatitis had fetal complications. P value is 0.267. Out of 140 cases of covid-19, 23 (16.43%) had fetal complications. P value is 0.038. covid-19 had statistically significant correlation on fetal outcome. Preterm birth and caesarean delivery rates have been increased in many studies by **Bonet et al⁽²⁴⁾** and the increased risk appears to be limited to patients with severe or critical disease of Covid-19. This is consistent with our study showing 16.43% fetal complications in pregnant patients infected with Covid-19.

None of the 10 cases of urinary tract infection, 6 cases of malaria and 6 cases of meningitis had fetal complications. Out of 5 cases of sepsis, 3 cases (60%) had fetal complications (p value 0.0004). Sepsis had statistically significant association on fetal outcome. So early treatment of sepsis will prevent adverse fetal outcome. **Surger's et al⁽²⁵⁾** found that bacteraemia during pregnancy was associated with a 29% risk of preterm delivery, with an overall fetal mortality rate of 10%; when maternal bacteraemia occurred during the second trimester, the fetal death rate was 40%. Our study is showing more fetal complications as our study is from developing countries where maternal infections are more common and fetal complications are high as found by **Archana kumara et al⁽²⁶⁾**.

CONCLUSION

Infectious diseases are very common in Pregnancy as there is immunological alterations, increasing the susceptibility to various infections. Meningitis and sepsis had statistically significant association with maternal mortality. Early diagnosis and prompt management of meningitis and sepsis will prevent maternal morbidity and mortality.

Fetal complications had statistically significant association with in 3rd trimester of pregnancy. Regular ANC visits with fetal monitoring especially in later trimesters will prevent fetal complications. Sepsis had adverse effects on fetal outcome. Early recognition and prompt intervention will prevent both maternal and fetal complications. Also, covid-19 had significant association on fetal outcome. Since the study was conducted during covid-19 pandemic, more area of research needs to be done.

REFERENCES:

1. Cervantes-Gonzalez M, Launay O. Pandemic influenza A (H1N1) in pregnant women: impact of early diagnosis and antiviral treatment. *Expert Rev Anti Infect Ther*. 2010;8:981-4.
2. Mosby LG, Rasmussen SA, Jamieson DJ. 2009 pandemic influenza A (H1N1) in pregnancy: a systematic review of the literature. *Am J Obstet Gynecol*. 2011;205:10-8.
3. Siston AM, Rasmussen SA, Honein AM, et al. Pandemic 2009 influenza A(H1N1) virus illness among pregnant women in the United States. *JAMA*. 2010;303:1517-25.
4. Kumar A, Beniwal M, Kar P, Sharma JB, Murthy NS. Hepatitis E in pregnancy. *Int J Gynaecol Obstet*. 2004;85:240-4.
5. Rijken MJ, McGready R, Boel ME, et al. Malaria in pregnancy in the Asia-Pacific region. *Lancet Infect Dis*. 2012;12:75-88.
6. Rogerson SJ. Malaria in pregnancy and the newborn. *Adv Exp Med Biol*. 2010;659:139-52.
7. Menendez C. Malaria during pregnancy. *Curr Mol Med*. 2006;6:269-73.
8. Machado CR, Machado ES, Rohloff RD, Azevedo M, Campos DP, de Oliveira RB, et al. Is Pregnancy Associated with Severe Dengue? A Review of Data from the Rio de Janeiro Surveillance Information System. *PLoS Neglected Tropical Diseases*. 9 mai 2013;7(5):e2217. pmid:23675548
9. Mathad JS, Gupta A. Tuberculosis in pregnant and postpartum women: epidemiology, management, and research gaps. *Clin Infect Dis*. 2012;55: 1532-1549
10. Gupta A, Nayak U, Ram M, Bhosale R, Patil S, Basavraj A, et al. Byramjee Jeejeebhoy Medical College-Johns Hopkins University Study Group Postpartum tuberculosis incidence and mortality among HIV-infected women and their infants in Pune, India, 2002-2005. *Clin Infect Dis*. 2007;45: 241-249
11. Asuquo B, Vellore AD, Walters G, Manney S, Mignini L, Kunst H. A case-control study of the risk of adverse perinatal outcomes due to tuberculosis during

- pregnancy. *J Obstet Gynaecol*. 2012;32: 635-638.
12. Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet*. 2020; (published online Feb. 12, 2020)
 13. 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
 14. Segars J, Katler Q, McQueen DB, Kotlyar A, Glenn T, Knight Z, Feinberg EC, Taylor HS, Toner JP, Kawwass JF. Prior and novel coronaviruses, coronavirus disease 2019 (COVID-19), and human reproduction: what is known? *Fertil Steril*. 2020;113(6):1140-9
 15. Mohr-Sasson A, Chayo J, Bart Y, Meyer R, Sivan E, Mazaki-Tovi S, Yonon Y. Laboratory characteristics of pregnant compared to non-pregnant women infected with SARS-CoV-2. *Arch Gynecol Obstet*. 2020:1-6.
 16. Sutton D, Fuchs K, D'Alton M, Goffman D. Universal Screening for SARS-CoV-2 in Women Admitted for Delivery. *The New England journal of medicine*. 2020;382(22):2163-2164.
 17. Yan Y, Shin WI, Pang YX, Meng Y, Lai J, You C, Zhao H, Lester E, Wu T, Pang CH. The First 75 Days of Novel Coronavirus (SARS-CoV-2) Outbreak: Recent Advances, Prevention, and Treatment. *Int J Environ Res Public Health*. 2020;17(7).
 18. Kant S, Lohiya A, Kapil A, Gupta SK. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. *Indian J Public Health*. 2017;61:118-2
 19. Adriani KS, Brouwer MC, Van Der Ende A, Van De Beek D. Bacterial meningitis in pregnancy: report of six cases and review of the literature. *Clinical microbiology and infection*. 2012 Apr 1;18(4):345-51.
 20. Vasquez DN, Estenssoro E, Canales HS, et al. Clinical characteristics and outcomes of obstetric patients requiring ICU admission. *Chest*. 2007;131:718-24
 21. Albright CM, Has P, Rouse DJ, Hughes BL. Internal validation of the Sepsis in Obstetrics Score to identify risk of morbidity from sepsis in pregnancy. *Obstet Gynecol*. 2017;130: 747-755
 22. Mehari MA., Maeruf H, Robles CC. et al. Advanced maternal age pregnancy and its adverse obstetrical and perinatal outcomes in Ayder comprehensive specialized hospital, Northern Ethiopia, 2017: a comparative cross-sectional study. *BMC Pregnancy Childbirth*. 2020;20(2020).
 23. Paixão ES, Teixeira MG, Costa M da CN, Rodrigues LC. Dengue during pregnancy and adverse fetal outcomes: a systematic review and meta-analysis. *Lancet Infect Dis*. 2016;16(7):857-65.
 24. Allotey J, Stallings E, Bonet M, et al. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. *BMJ*. 2020;370:m3320.
 25. Surgers L, Valin N, Carbone B, et al. Evolving microbiological epidemiology and high fetal mortality in 135 cases of bacteraemia during pregnancy and postpartum. *Eur J Clin Microbiol Infect Dis*. 2013;32: 107-113
 26. Kumari A, Suri J, Mittal P. Descriptive audit of maternal sepsis in a tertiary care centre of North India. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2017;7(1):124-7.