Fetomaternal Outcome In Pregnancies Complicated With Hcv Infection

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Abstract

Introduction- Hepatitis C virus (HCV) infection has an estimated global prevalence of 2%–3%, with approximately 122–185 million HCV-infected persons worldwide. Globally, up to 8.0% of pregnant women are infected with HCV in highly endemic areas. Vertical transmission can occur through intrauterine, intrapartum, and postnatal routes. The infants born to women infected with HCV are more likely to be small for gestational age, have low birth weight, require admission to the neonatal intensive care unit, and require assisted ventilation.

Aims and Objectives- To evaluate the feto-maternal outcomes in pregnancies positive for Hepatitis C virus infection. The objectives were to analyse feto-maternal outcomes, to evaluate hepatic and virologic parameters and to assess the risk factors associated with Hepatitis C virus infection in pregnancy.

Material and Methods- This prospective observational study was conducted on 50 female patients with Hepatitis C infection in the Department of Obstetrics and Gynaecology at PGIMS Rohtak over a period of one year, from March 2024 to February 2025. The inclusion criterion were patients aged 18-45 years, with singleton pregnancy, found positive for hepatitis C virus infection by ELISA and PCR. The exclusion criterion were patients positive for Hepatitis A, B, D, E and known case of liver/renal disease. The sample size was calculated based on the expected prevalence of preterm delivery in Hepatitis C patients, which was found to be 35.5% in a previous study by Yasmin H et al.

Conclusion- The study concluded that HCV infection in pregnancy is associated with increased risk of adverse obstetric outcomes, including PROM, preterm birth, and fetal growth restriction, likely mediated by subtle hepatic dysfunction and placental involvement. Though maternal prognosis was generally favorable, fetal and neonatal complications were more frequent which included SGA, low APGAR scores and NICU admissions, emphasizing the need for enhanced antenatal surveillance, early detection of obstetric complications, and multidisciplinary perinatal care.

Introduction- Hepatitis C virus (HCV) infection has an estimated global prevalence of 2%–3%, with approximately 122–185 million HCV-infected persons worldwide.[1] Based on the prevalence of anti-HCV antibodies, different areas of the world are categorized as 'high' prevalence (>3.5%), 'moderate' prevalence (1.5%–3.5%), or 'low' prevalence (<1.5%). The prevalence of HCV infection in India has been variously estimated as 0.9 and 1.9%.[2,3] Since India has one-fifth of the world's population, therefore, it accounts for a large proportion of the worldwide HCV burden. In a meta-analysis of 30 studies, the pooled prevalence rate of HCV and hepatitis B virus (HBV) coinfection was 1.89% in India.[4] The prevalence rate of antibodies to HCV ranged between 7.2% and 76.6% in patients with HIV. Integration of HCV testing into existing programs catering to those at high risk (e.g., those with HIV) has shown an increase in the identification and treatment of such patients.[5] Until 2017, barely 2.0% of the blood banks in India had facilities for Nucleic acid amplification tests NATs, and limited results showed HCV positivity rates of 1 in about 5400 seronegative samples.[6] Globally, up to 8.0% of pregnant women are infected with HCV in highly endemic areas.[7] In surveillance published in 2017 revealed a nationwide increase in HCV infection among pregnant women and its vertical transmission [8,9] which is approximately 6%.[10] The risk of HCV vertical transmission increases if the maternal serum HCV viral load is above 10^5 copies/mL.[11] Vertical transmission can occur through intrauterine, intrapartum, and postnatal routes.[12,13] According to the American Association for the Study of Liver Diseases (AASLD) guidelines, all pregnant women should be tested for HCV infections,

ideally at the time of initiation of prenatal care.[14] In India, HCV genotype 3 is the predominant genotype as compared with genotype 1 in the West.[15] All-cause mortality, progression to cirrhosis, and development of hepatocellular cancer are highest in patients with genotype 3.[16] Widespread, rapid, and cheap availability of HCV-RNA testing and a cost-effective mechanism to provide uninterrupted free drugs are essential if we aim to reach the elimination target by 2030.[17] HCV RNA may increase in infected women during the second and third trimesters of pregnancy due to the down-regulation of the maternal immune response. Because hepatocellular damage caused by chronic HCV infection is thought to be immune-mediated rather than directly caused by viral cytotoxicity, down-regulation of the maternal immune response in pregnancy reduces the amount of hepatocellular damage caused by HCV, accounting for the decrease in ALT levels.[18,19] The infants born to women infected with HCV are more likely to be small for gestational age, have low birth weight, require admission to the neonatal intensive care unit, and require assisted ventilation. HCV-infected women are more likely to deliver infants with poor birth outcomes, including preterm birth, low birth weight, congenital anomalies, and intrahepatic cholestasis.[20] Current guidelines from the American College of Obstetrics and Gynaecologists (ACOG) and the Centers for Disease Control and Prevention (CDC) recommend risk-based screening for HCV in pregnant women. For pregnant women with confirmed active HCV infection, a quantitative HCV RNA test should be done to determine the baseline viral load, along with. basic laboratory testing. is advised to evaluate the extent of liver disease. HCV positive women should also be screened for other sexually transmitted diseases, including HIV, syphilis, gonorrhoea, Chlamydia, and hepatitis B virus (HBV) (Grade1B).[21,22] Antiviral treatment for HCV is not recommended yet in pregnancy. Although HCV affects a significant number of pregnant women, there are limited data regarding the impact of HCV active infection on pregnancy and infant outcomes. With that in mind, we did a study on fetomaternal outcomes in pregnancies complicated by hepatitis C virus infection.

Aim and Objectives -To evaluate the feto-maternal outcomes in pregnancies positive for Hepatitis C virus infection. The objectives were to analyse feto-maternal outcomes, to evaluate hepatic and virologic parameters and to assess the risk factors associated with Hepatitis C virus infection in pregnancy

Material and Methods- This prospective observational study was conducted on 50 female patients with Hepatitis C infection in the Department of Obstetrics and Gynaecology at PGIMS Rohtak over a period of one year, from March 2024 to February 2025. The inclusion criterion were patients aged 18-45 years, with singleton pregnancy, found positive for hepatitis C virus infection by ELISA and PCR. The exclusion criterion were patients positive for Hepatitis A, B, D, E and known case of liver/renal disease. The sample size was calculated based on the expected prevalence of preterm delivery in Hepatitis C patients, which was found to be 35.5% in a previous study by Yasmin H et al[23]. After obtaining ethical clearance and informed consent, participants were subjected to a detailed medical history, including sociodemographic data and risk factors such as blood transfusions, previous surgeries, drug abuse, and other relevant exposures. A thorough general physical and obstetric examination was performed. Routine antenatal investigations were conducted, including haemoglobin estimation, blood grouping, syphilis testing (STS), thyroid profile, glucose challenge test (GCT), and HIV testing. Specific serological tests for Hepatitis A, B, D, E, and liver function tests (LFTs) were also performed. The LFTs included serum bilirubin, liver enzymes (SGOT, SGPT), total proteins, serum albumin, serum globulin and international normalized ratio (INR). Real-time PCR testing was used to measure serum levels of HCV RNA. Participants with undetectable HCV RNA levels were excluded from the study. The husband of each participant was also tested for HCV, and if found negative, barrier contraception was advised. Participants were followed throughout their pregnancy until delivery. Data were collected and recorded in a pre-structured proforma. Maternal outcomes were assessed in terms of gestational age at delivery, mode of delivery (spontaneous or induced), and any maternal complications such as obstetric cholestasis, gestational diabetes mellitus, preeclampsia, and postpartum hemorrhage (PPH). The need for blood transfusion and any adverse maternal outcomes like miscarriage, fetal distress, or ICU admission were also documented. Fetal outcomes were evaluated based on live birth or stillbirth status, Apgar scores at 1 and 5 minutes, birth weight, and the need for neonatal resuscitation. The presence of congenital malformations and the color of the amniotic fluid were also recorded.

Ethical Considerations- The study was conducted following ethical guidelines, and ethical clearance was obtained from the institutional ethics committee of PGIMS Rohtak before the commencement of the study. Informed consent was obtained from the patients before they participated in the study. Patient confidentiality and privacy were strictly maintained throughout the study.

Statistical Analysis - Data were entered into an MS Excel spreadsheet and coded for analysis. Descriptive statistics were used to summarize the data, with qualitative data presented as frequencies and percentages, and quantitative data as means with standard deviations. Statistical tests such as Chi-square and t-tests were employed where applicable to determine the significance of associations. All analyses were conducted using SPSS-23.0 software. The level of statistical significance was set at a p-value of ≤ 0.05. Results were presented in tables and graphs.

Observations- This present prospective observational study was conducted on 50 patients aged 18-45 years with singleton pregnancy and found positive for hepatitis C virus infection by ELISA and PCR

Age (in years)	Number of Participants (n=50)	Percentage (%)
≤20	6	12
21-30	37	74
31-40	7	14
Mean ± S. D	26.29±4.58	

Table 1. Distribution of patients according to age (in years)

Education level	Number of Participants (n=50)	Percentage (%)
Illiterate	8	16
Primary	4	8
Secondary	34	68
Graduate	4	8

Table 2. Distribution of patients according to Education level

BMI (kg/m^2)	Number of Participants (n=50)	Percentage (%)
<18.50 (Underweight)	8	16
18.50-24.99 (Normal)	38	76
25.00-29.99 (Overweight)	4	8

≥30.00-34.99 (Obesity 1st class)	0	0

Table 3. Distribution of patients according to Socio-economic status

Parity	Total (n=50)	Percentage (%)
Nulliparous	12	24
Multiparous	38	76

Table 4. Distribution of patients according to Parity status

Type of Labor	Number of Participants (n=50)	Total (n=50)
Spontaneous labor	31	62
Induced labor	19	38

Table 5. Distribution of patients on basis of Spontaneous Labou

Risk factors	Number of Participants (n=50)	Percentage (%)
No risk factors	26	52
h/o Abortion (Surgical abortion)	10	20
h/o Blood transfusion	5	10
h/o previous surgery	8	16
h/o dental procedure	1	2

Table 6. Distribution of Risk Factors in patients

Mode of delivery	Number of Participants (n=50)	Percentage (%)
Full Term Vaginal Delivery	35	70
Pre Term Vaginal Delivery	7	14
Lower Segment Cesarean Section	6	12
Cesarean Hysterectomy	1	2
Spontaneous Abortion	1	2

Table 7. Distribution of patients on basis of Delivery

Indication of LSCS	Number of Participants (n =6)	Percentage (%)
Fetal distress	2	50.00
Failed induction	3	33.33
h/o Abdominal myomectomy	1	16.67

Table 8. Distribution of patients on basis of indication of Caesarean section

Fetal complications	Number of Participants (n=50)	Percentage (%)
None	26	52
SGA	15	30
Prematurity	7	14
Congenital Malformations	2	4
RDS	2	4

Neonatal death after 24 hours	1	2

Table 9. Distribution of patients on basis of indication of Fetal complications

Maternal complications	Number of Participants (n=50)	Percentage (%)
None	23	46
Abortion	1	2
Oligohydramnios	2	4
FGR	4	8
GDM	1	2
Pre term labor	3	6
PPROM	5	10
PROM	7	14
IUD	1	2
PPH	2	4
ICU Stay	1	2

Table 10. Distribution of patients on basis of indication of Maternal complications

NICU admission	Number of Participants (n=50)	Percentage (%)
Yes	7	14

No	43	86

Table 11. Distribution of patients on basis of indication of NICU admission

Birth Weight	Number of Participants (n=50)	Percentage (%)
<2.5 Kg	11	22
≥2.5 Kg	39	78

Table 12. Distribution of patients on basis of Birth weight of Babies

Fetal characteristics	Number of Participants (n=50)
APGAR Mean±SD. (1 minute)	6.42 ±1.76
APGAR Mean±SD. (5 minutes)	8.82±2.24

Table 13. Distribution of patients on basis of Fetal outcomes

Discussion- Acute viral hepatitis represents a significant issue for public health. The occurrence of hepatitis during pregnancy differs globally. The prevalence is approximately 0.1% in developed nations, while, it ranges from 3% to 20% or in developing nations. [24] In the present study, the age of participants ranged from below 20 to 40 years, with a mean age of 26.29 ± 4.58 years. The majority of women (74%) were in the 21–30 years age group, which represents the most common reproductive age group which is in line with other studies.[25,26] In the present study, a majority of the participants (68%) had attained secondary-level education, while a smaller proportion were illiterate (16%). Additionally, 8% had completed their primary education, and another 8% were graduates. The current study revealed that a substantial percentage of participants were housewives (70%), suggesting a predominantly non-working or home-focused demographic for the analysis. Twenty percent of the participants were engaged in labour roles, while ten percent held salaried positions. The analysis of socio-economic status indicated that 36%, of participants, belonged to the lower middle class, followed by 24% from the lower class and 22% from the upper lower class. A smaller proportion of participants were classified within the upper middle (12%) and high (6%) socio-economic categories. The findings indicate that a considerable number of participants in the study came from lower and middle socio-economic backgrounds which is in alignment with study conducted by Akhtar, A.M. etal[27]. These findings signify that lower educational and socioeconomic status may be associated with a higher risk of HCV infection during pregnancy, likely due to reduced health awareness, limited access to safe medical practices, and

inadequate preventive care. In the current study, a considerable section displayed a normal BMI (18.50–24.99 kg/m²), accounting for 76% of the study population. Those identified as underweight, possessing a BMI below 18.50 kg/m², represented 16% of the population, while individuals deemed overweight, constituted 8% of the study population. Every participant was below the obesity threshold (≥30.00 kg/m²). The findings indicate that most participants maintained a typical body weight. On the contrary Pan CQ et al**.** observed that the majority (67.1%) had a pre-pregnancy body mass index (BMI) in the range of 23–29 kg/m², indicating that most participants were within the overweight category.[28] A smaller proportion (27.8%) were obese (BMI ≥ 29 kg/m²), while only 5.1% had a BMI below 23 kg/m². This distribution suggests that higher BMI was relatively common among HCV-positive mothers which is contrary to the findings of the present study. The present study revealed that majority of women (76%) were multiparous women, while primigravidae represented 24% of the sample. This indicates that most participants had experienced one or more previous pregnancies. [29] In a study, conducted by Goyal LD et al**.** about, 40% were primiparous, while 60% were multiparous which along similar line to the present study.[23] The study conducted by Money D et al. revealed that 25.2% were nulliparous, while the rest were multiparous, consistent with the findings of the current Study.[29] In the present study, over half of the women (52%) showed no discernible risk factors for hepatitis C virus infection. While 20% of the participants gave a history of surgical abortion, whereas 16% had history of other surgical interventions, about 10% of the women gave a history of receiving a blood transfusion. Furthermore, 2% gave history of dental procedures. The results suggest that while a notable percentage of women exhibited no clear risk factors, a substantial portion had prior medical or surgical experiences that might contribute to the transmission of HCV. In the study carried out Goyal LD et al. involving 40 HCV-infected pregnant women, several potential risk factors associated with hepatitis C virus transmission were identified. A history of previous surgery was the most frequently reported factor, observed in 40% of participants, followed by a history of abortion in 20% and dilation and curettage (D&C) procedures in 15%. Additionally, 10% of women reported a history of blood transfusion, while 2.5% had undergone dental procedures. [23] These findings suggested that medical and surgical interventions constitute important routes of potential HCV exposure among pregnant women which is in contrast with the present study. In the present study, 62% of the subjects passed into spontaneous labour, whereas 38% needed induction of labour. In the Study carried out by Marwah S. et al. among women who tested positive for anti- HCV antibodies, a significant proportion (72.7%) passed into spontaneous labour, whereas 21.2% underwent labour induction. The findings indicate that HCV infection generally does not significantly impact the natural onset of labour in majority of instances which is in line with the present study. [30] In the present study, the majority of participants (58%) delivered between 37 weeks and 39 weeks + 6 days of gestation, indicating that most births occurred at term. Preterm deliveries accounted for 22% of the total, with 12% occurring before 34 weeks and 10% between 34 weeks and 36 weeks + 6 days of gestation. Additionally, 20% of women delivered at 40 weeks or beyond, representing post-term births. The occurrence of preterm births among HCV-infected women may reflect the influence of maternal infection, systemic inflammation, or associated obstetric complications on pregnancy duration. In the study conducted by Mir S et al. the majority of women delivered at term (≥37 weeks), accounting for 82.1% of cases, while 17.9% delivered preterm (<37 weeks). [31] A study carried out by Soliman AE et al. revealed that the gestational age at delivery varied between 30 and 40 weeks, with an average gestational age of 34.74 ± 3.39 weeks. This indicates an increased probability of preterm delivery within the study group, potentially highlighting the impact of maternal factors like HCV infection.[25] In a study conducted by Yasmin H et al. revealed that 29.7% of mothers with HCV delivered prior to 36 weeks of gestation, highlighting a significant occurrence of preterm births.[26] In the study carried out by Pan CQ et al. the mean gestational age of pregnant women was 273 days, indicating that the majority of infections were identified close to term.[28] In the present study 42 (84%) women among the 50 participants had successful vaginal deliveries, out of which 35 (70%) were term and 7 (14%) were preterm. Of the 50 participants, 6 (12%) had lower segment cesarean section (LSCS), while cesarean hysterectomy was performed on one (2%) case, while one (2%) had spontaneous expulsion of the fetus at < 24 weeks POG. In study carried out by Mir S et al. it was found that 37.3% among pregnant women with HCV infection, experienced normal vaginal delivery, whereas 62.7% had cesarean sections.[31] In the study Goyal LD et al**.** out of 40 pregnant women who tested positive for HCV, 17 (42.5%)

experienced vaginal delivery, whereas 23 (57.5%) had cesarean sections.[23] This suggests that a somewhat increased percentage of women experienced surgical delivery. In the study carried out by Money D. et al. involving 108 HCV positive pregnant women about 32% underwent cesarean delivery. This suggests that although a significant number of women experienced surgical delivery, the predominant outcome was vaginal birth.[29] In the study Pan CQ et al. revealed that out of 79 pregnant women who tested positive for HCV RNA, 38 (48.1%) underwent cesarean delivery. This suggests that almost 50% of the women with viremia had operative deliveries, whereas the rest gave birth vaginally.[28] The current Study Marwah S. et al. revealed that out of 33 pregnant women infected with HCV, a significant majority (72.7%) experienced vaginal delivery, whereas 27.3% had a lower segment cesarean section (LSCS).[30] In the current study involving 50 participants, the primary reason identified was failed induction (50%). Fetal distress was noted in two patients (33.33%), while one patient underwent a LSCS due to previous abdominal myomectomy. The results found that failed induction was the primary factor influencing the decision for operative delivery in HCV- positive pregnant women. Similar results were found out by Mir S et al. in which the most common indication for LSCS was acute fetal (54.8%) followed by oligohydramnios (14.3%), and color Doppler abnormalities and cephalopelvic disproportion (CPD) (7.1% each). Other less common indications included non-progression of labour (4.8%), intrauterine growth restriction (IUGR) (4.8%), macrosomia (4.8%), and malpresentation (2.4%). [31] These findings suggest that fetal compromise and obstetric complications, rather than HCV infection itself, primarily dictated the decision for cesarean delivery. In the current study no complications were noted in 46%, while the remaining 54% encountered various adverse outcomes. The most frequently reported complications were PROM (14%), pre term PROM (10%) and FGR (8%). Further complications noted included preterm labor (6%), oligohydramnios (4%), and PPH (4%). Rarely observed complications comprised abortion, intrauterine death (IUD), ICU admission, and gestational diabetes mellitus (GDM), with each incident occurring in 1 patient (2%). In the study carried out by Mir S et al. maternal complications among HCV-positive pregnant women were predominantly hematological and metabolic in nature. Thrombocytopenia (33.33%) cases, suggesting a possible association between chronic HCV infection and impaired platelet production or increased peripheral destruction. Additionally, PPH was reported in 3 (7.1%) women, which may be linked to the coexisting thrombocytopenia and hepatic dysfunction. Hypoglycemia was also noted in 3 (7.1%) participants, potentially reflecting altered glucose metabolism secondary to hepatic involvement. [31] In the study carried out on 40 women Goyal LD et al. the most commonly observed complications were anemia and preterm labor, suggesting that HCV infection may contribute to both hematologic compromise and adverse obstetric outcomes. Preeclampsia and antepartum hemorrhage (APH) were other complications noted, indicating potential vascular and placental involvement. Additionally, 8 participants had a history of abortion, highlighting possible reproductive consequences associated with chronic infection. [23] The Study carried out by Money D. et al. revealed hemorrhagic complications in 9.6% of the participants were observed, suggesting an elevated risk of bleeding tendencies potentially associated with hepatic dysfunction or thrombocytopenia. Additional complications observed were hypertension or preeclampsia (5.5%), cholestasis (4.8%), and placenta previa (4.1%), all of which may indicate the systemic impacts of HCV on maternal liver and vascular function. Furthermore, intrauterine fetal death and placental abruption (0.7%) were noted, in 3.4% and 0.7% of the participants respectively, underscoring the possibility of significant fetal compromise in a small subset of cases. [29] Pan CQ et al. observed that abnormal renal function emerged as the most common complication (62%) of the participants, indicating a possible systemic influence of HCV infection on renal physiology in the context of pregnancy. Anemia was observed in 19% of the population. Oligohydramnios was observed in 7.6% of cases, whereas gestational diabetes and abnormal thyroid function were each noted in 5.1% of participants, suggesting that endocrine disturbances may manifest in a portion of HCV-positive pregnancies. Preeclampsia and PROM was observed in 3.8% of cases each, indicating a comparatively minor impact on negative obstetric outcomes.[28] In the present study, majority of the newborns (52%), did not encounter any fetal complications. The complications were SGA (30%), prematurity (14%), AGA (28%), GCMF (4%), RDS) (4%) and one neonatal mortality was recorded. The mean APGAR score at 1 minute was 6.42 ± 1.76, rising to 8.82 ± 2.24 at 5 minutes, indicating satisfactory neonatal adaptation. The mean birth weight of the newborns was 2.66 ± 0.52 kg, suggesting that the majority of

infants were within the expected weight range for their gestational age. A total of 17 neonates (34%) were admitted to the NICU for observation or management of perinatal complications, with one neonatal death (2%) recorded. Study by Mir S et al. observed that a significant proportion (86.6%) of neonates had normal birth weights classified consisted with the findings of the present study. Low birth weight was noted in 16.7% of neonates, while NICU admission was required for 38.1% of cases. This indicates that almost two-fifths of infants born to mothers with HCV faced perinatal morbidity that required specialized care. Furthermore, intrauterine death was observed in 4.8% of pregnancies, underscoring a minor yet notable risk of negative fetal outcomes linked to maternal HCV infection which is similar to the present study. [31] The Study carried out by Goyal LD et al. observed that the average birth weight of the newborns was 2.56 kg, suggesting that, a lower birth weight was observed at term gestations, indicating intrauterine growth issues. Other observed parameters were stillbirth (n =2) alongside neonatal deaths (n = 8). Two neonates exhibited birth asphyxia, and eight newborns necessitated NICU admission. Neonatal complications were higher than the present study. [23] The Study carried out Soliman AE et al. assessed neonatal outcomes in a cohort of HCV- infected pregnant women (n = 120), revealing a mean neonatal birth weight of 2497.42 ± 445.11 g, which suggesting, borderline low birth weight. This finding indicates a possible impact of maternal HCV infection on intrauterine growth and fetal development. In terms of neonatal morbidity, 18.3% of the newborns necessitated NICU admission, whereas 81.7% did not.[25]

Conclusion- The study concluded that HCV infection in pregnancy is associated with increased risk of adverse obstetric outcomes, including PROM, preterm birth, and fetal growth restriction, likely mediated by subtle hepatic dysfunction and placental involvement. Though maternal prognosis was generally favorable, fetal and neonatal complications were more frequent which included SGA, low APGAR scores and NICU admissions, emphasizing the need for enhanced antenatal surveillance, early detection of obstetric complications, and multidisciplinary perinatal care. These findings reinforce that HCV infection remains a significant yet underrecognized determinant of adverse pregnancy and neonatal outcomes, meriting routine screening and appropriate follow-up during pregnancy.

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