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FREQUENCY OF LOW-BIRTH-WEIGHT INFANTS IN HEPATITIS C POSITIVE MOTHERS

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Abstract

Objective: *To determine frequency of low-birth-weight infants in hepatitis C positive mothers.*

Study Design: *Cross Sectional Study.*

Settings: *Department of Obstetrics and Gynecology,*

Duration of Study: *Six months after the approval of synopsis(letter no. MNCH/admin/23/973 dated 27-10-23) Jan to June 2024.*

Methodology: *A total of 172 participants. The inclusion criteria comprised pregnant women aged 18 to 45 years, with any parity, gestational age beyond 24 weeks, and confirmed hepatitis C infection, as determined by the presence of Anti-HCV antibodies in serum using a third-generation ELISA test. A thorough systemic and gynecological examination was conducted for each participant. A 5 ml blood sample was drawn from a peripheral vein and tested for Anti-HCV antibodies using a third-generation ELISA test in the hospital laboratory. Women diagnosed with hepatitis C were followed until delivery. The birth weight of each newborn was measured immediately after delivery using a standard infant weight machine, and the weight was recorded in grams. LBW was defined according to WHO criteria, as a birth weight of less than 2500 grams.*

RESULTS: *The mean neonatal birth weight was 2887.46 grams (±488.30). The overall frequency of LBW in Hepatitis C-positive mothers was 36 out of 172 cases (20.9%), while 136 (79.1%) had normal birth weight infants.*

CONCLUSION: *Our findings highlight a high burden of LBW, additional studies are necessary to clarify the precise pathophysiological mechanisms and optimal management strategies for this vulnerable population.*

INTRODUCTION:

Hepatitis C infection is one of the most prevalent causes of liver disease such as cirrhosis and hepatocellular carcinoma.[1-3] Approximately 71 million people are infected with hepatitis C in terms of significant morbidity and mortality.[4-6] Hepatitis C infection is becoming more common among pregnant women, with potential complications for both maternal and fetal health. Infants born with HCV may develop chronic infection, which can progress to liver cirrhosis and hepatocellular carcinoma over time. Currently, over 8% of pregnant women worldwide are estimated to be infected with HCV.[7] The prevalence of HCV in pregnant women

is reported between 0.6% - 2.4%, with overall mother to infant transmission varying from 8%-15%.[7] Considering this high prevalence, ASLD, CDC, in addition to the Infectious Disease Society of America, and most recently recommended by the ACOG, screening for HCV is stressed in all pregnant women, regardless of the presence of any causative factors for HCV.[8,9] Implications for the health of children born to women with HCV include the risk of vertical transmission of HCV, but in addition may include low birth weight, small size for gestational age, and admission to the NICU.[10-13] Recent studies have demonstrated the presence of maternal HCV in placenta. Therefore, maternal HCV infection could potentially lead to placental insufficiency and subsequent adverse maternal and neonatal outcomes. However, previous research on the relationship between maternal HCV (+) status and the risk of unfavorable pregnancy outcomes has been conducted retrospectively or used from surveillance databases. Therefore, there is very little information on the link between virological parameters and perinatal outcomes.[14]

Yasmin et al in their study evaluated presence of Hepatitis C virus infection and the association of maternal and fetal outcome in these women where a total of 202 pregnant were enrolled and 15.35% (31/202) cases were recorded with positive HCV whereas Low Birth Weight (LBW) was recorded in 32.3%.[15]

The above statistics and our clinical experience needs to screen, monitor and provide standard care in these cases to evaluate/manage fetal outcome. This study planned to determine fetal outcome in term of low birth weight in pregnant women with Hepatitis C virus infection so that documented evidence may be added to the existing literature on this issue.

METHODOLOGY

This cross-sectional study was conducted at the Department of Obstetrics and Gynecology over a period of six months following the approval of the study synopsis. The study aimed to determine the frequency of low-birth-weight (LBW) infants among hepatitis C-positive mothers. Ethical approval was obtained from the Institutional Review Board, and informed consent was secured from all participants before their inclusion in the study. The participants were assured of the confidentiality of their information.

The sample size was calculated using the WHO sample size calculator, with a 95% confidence level, 7% absolute precision, and an anticipated proportion of 32.03%, resulting in a total of 172 participants. A non-probability consecutive sampling technique was used for patient selection. The inclusion criteria comprised pregnant women aged 18 to 45 years, with any parity, gestational age beyond 24 weeks, and confirmed hepatitis C infection, as determined by the presence of Anti-HCV antibodies in serum using a third-generation ELISA test. Patients with other types of viral hepatitis (Hepatitis A, B, D, and E), non-viral hepatitis (such as autoimmune hepatitis), primary biliary cirrhosis, or hemolytic anemia were excluded from the study.

Once enrolled, detailed medical histories were obtained, focusing on gestational weeks at term, previous history of jaundice, drug intake, abortions, miscarriages, and prior deliveries of LBW infants. A thorough systemic and gynecological examination was conducted for each participant. A 5 ml blood sample was drawn from a peripheral vein and tested for Anti-HCV antibodies using a third-generation ELISA test in the hospital laboratory. Women diagnosed with hepatitis C were followed until delivery. The birth weight of each newborn was measured immediately after delivery using a standard infant weight machine, and the weight was recorded in grams. LBW was defined according to WHO criteria, as a birth weight of less than 2500 grams. All collected data were recorded on a structured proforma.

Data analysis was performed using SPSS version 25.0. Quantitative variables such as maternal age, gestational age, and neonatal birth weight were presented as mean ± standard deviation (SD). Categorical variables, including parity, previous history of LBW infants, and LBW outcome, were reported as frequencies and percentages. A chi-square test was applied to assess associations between categorical variables. Effect modifiers, such as maternal age, gestational age at birth, parity, and prior history of LBW infants, were addressed through stratification. Post-stratification, the chi-square test was reapplied to evaluate the effect of

these variables on the outcome. A p-value ≤ 0.05 was considered statistically significant.

RESULTS:

Table 1: Demographic Information of Hepatitis C-Positive Mothers

Demographic information of hepatitis C-positive mothers(n=172)

Variables	Group	Frequency	%
Maternal age (years)	18-30	81	47.1
	>30-40	91	52.9
Gestational age (weeks)	24-36	132	76.7
	>36-40	40	23.3
Parity	1	38	22.1
	2	37	21.5
	3	36	20.9
	4	21	12.2
	5	40	23.3
Previous history of LBW	Yes	46	26.7
	No	126	73.3

Table 1 presents the demographic characteristics of 172 hepatitis C-positive mothers included in the study. The maternal age distribution shows that 47.1% of participants were aged between 18 to 30 years, while 52.9% were aged above 30 to 40 years, indicating a relatively even distribution across age groups, the mean maternal age of the study participants was 29.65 years (±6.32). Regarding gestational age, the majority (76.7%) of pregnant women had a gestational age between 24 to 36 weeks, while 23.3% had completed more than 36 to 40 weeks of pregnancy, mean gestational age at birth was 31.37 weeks (±5.36). The parity distribution reveals a nearly uniform spread across different parity levels. Specifically, 22.1% of mothers were primiparous (parity = 1), while 21.5%, 20.9%, and 12.2% had parity levels of 2, 3, and 4, respectively. The highest proportion (23.3%) was found among women with parity 5, mean parity was 2.93 (±1.47). In terms of previous history of low birth weight (LBW) infants, 26.7% of mothers had a prior LBW infant, whereas 73.3% had no such history. The mean neonatal birth weight was 2887.46 grams (±488.30).

Table 2: Frequency of Low Birth Weight in Hepatitis C-Positive Mothers

Frequency of low birth weight in hepatitis C-positive mothers(n=172)

Variables	Group	Low birth weight		P value
		Yes(%)	No(%)	
Maternal age (years)	18-30	15(41.7%)	66(48.5%)	0.463
	>30-40	21(58.3%)	70(51.5%)	
Gestational age (weeks)	24-36	28(77.8%)	104(76.5%)	0.869
	>36-40	8(22.2%)	32(23.5%)	
Parity	1	5(13.9%)	33(24.3%)	0.260
	2	7(19.4%)	30(22.1%)	
	3	8(22.2%)	28(20.6%)	
	4	8(22.2%)	13(9.6%)	
	5	8(22.2%)	32(23.5%)	
Previous history of LBW	Yes	25(69.4%)	101(74.3%)	0.561

	No	11(30.6%)	35(25.7%)	

The table presents the frequency of low birth weight (LBW) among Hepatitis C-positive mothers (n=172) and examines its association with maternal age, gestational age, parity, and previous history of LBW. Among mothers aged 18–30 years, 15 (41.7%) had LBW infants, whereas 66 (48.5%) had normal birth weight infants. In the >30–40 years age group, 21 (58.3%) had LBW infants, while 70 (51.5%) had normal birth weight infants (p = 0.463), indicating no significant association between maternal age and LBW. Regarding gestational age, most LBW cases (28 out of 36, or 77.8%) occurred in preterm births (24–36 weeks), compared to 104 (76.5%) in the normal birth weight group. Only 8 (22.2%) LBW cases were seen in term births (>36–40 weeks), similar to 32 (23.5%) in the normal birth weight group (p = 0.869), suggesting no significant link between gestational age and LBW. For parity, the highest proportion of LBW infants was observed in mothers with parity 3, 4, and 5 (22.2% each), whereas parity 1 and 2 had 13.9% and 19.4% LBW cases, respectively. The distribution of normal birth weight infants was more varied, with parity 1 accounting for 24.3%, parity 2 for 22.1%, parity 3 for 20.6%, parity 4 for 9.6%, and parity 5 for 23.5%. The p-value (0.260) suggests no statistically significant association between parity and LBW. Lastly, among mothers with a previous history of LBW, 25 (69.4%) had LBW infants in the current pregnancy, compared to 101 (74.3%) in the normal birth weight group. Mothers without a history of LBW had 11 (30.6%) LBW infants and 35 (25.7%) normal birth weight infants (p = 0.561), showing no significant relationship. The overall frequency of LBW in Hepatitis C-positive mothers was 36 out of 172 cases (20.9%), while 136 (79.1%) had normal birth weight infants. None of the examined factors, including maternal age, gestational age, parity, and previous history of LBW, showed a significant association with LBW in this population.

DISCUSSION:

Hepatitis C virus (HCV) infection during pregnancy has been increasingly recognized as a significant public health concern due to its potential adverse effects on maternal and neonatal outcomes. Despite the well-documented risks of vertical transmission, fetal growth restriction, and low birth weight (LBW), the precise pathophysiological mechanisms linking maternal HCV infection to these complications remain incompletely understood. Considering the higher prevalence of HCV in pregnant women, it is pertinent to evaluate its perinatal outcomes. Our study planned to estimate the frequency of LBW infants among hepatitis C-positive mothers.

Our data analysis reveals majority of the cases between 30-40 years of age by calculating 52.9% whereas 18 and 30 years of age were recorded in 47.1%, the mean age of 29.65 ± 6.32 years. This aligns with Chen et al. (2023)[16] who reported similar findings by calculating a median maternal age of 28 years in HCV-positive pregnant women. Regarding parity, we found almost similar proportionate with the parity levels of 1-5 and a mean parity of 2.93 ± 1.47. This is aligned with the findings of Rajoriya and colleagues,[17] who recorded 65.8% of HCV-positive women with multigravida.

Our study indicated 76.7% of pregnancies between 24 and 36 weeks of gestation, whereas 23.3% were full-term (>36 weeks). Pan and colleagues (2022)[18] found same pattern in their study, where preterm deliveries were more common among HCV-positive females, concluding that HCV infection may contribute to preterm labor. In terms of prior history of LBW, 26.7% of pregnant women in our study population had positive history of previous LBW infant. Liu and others (2025)[19] capitalized maternal comorbidities, including HCV co-infection, as key predictors of LBW, reinforcing the significance of previous obstetric history in neonatal risk assessment .

Our study found that the mean neonatal birth weight was 2887.46 ± 488.30 grams, with an overall LBW frequency of 20.9%. This aligns with previous research that has highlighted the impact of HCV on fetal growth. Pan et al (2022)[18] reported significantly lower neonatal weights in HCV-positive mothers (3105.1 ± 459.4 grams vs. 3278.3 ± 462.0 grams in controls; p = 0.006). Hughes et al (2017)[20] also noted an increased risk of fetal growth restriction and LBW in HCV-infected mothers. In contrast, Jaffery and colleagues (2005)[21] found no significant difference in

neonatal birth weight between HCV-positive and HCV-negative mothers (p = 0.94), concluding that other factors, like coexisting maternal conditions, may mediate the impact of HCV on neonatal outcomes. Wasuwanich and others[18] (2023) demonstrated a significantly higher incidence of preterm births in HCV-positive pregnant women. Chen et al (2023)[16] also reported a strong association between maternal HCV infection and increased risk of preterm labor and fetal distress, however, we did not evaluate preterm birth in our study. Whereas, Pinto et al (2021)[22] identified preterm delivery as a major contributor to adverse neonatal outcomes in their study on HCV-infected pregnant women in Brazil. These findings suggest that maternal HCV infection may contribute to placental dysfunction, leading to premature labor and restricted fetal growth.

Our study did not specifically evaluate the mode of delivery, however, previous studies are of the view that an increased likelihood of cesarean section among HCV-positive mothers. Pan et al. (2022)[10] reported a significantly higher rate of cesarean deliveries in HCV-positive mothers (48.1% vs. 27.8% in controls, p = 0.004). Similarly, Rajoriya et al[17] found a 31.13% cesarean section rate among pregnant women with hepatitis B, which shares similar perinatal risks. Anemia was another notable complication in previous studies. Pan et al (2022)[18] found that 19% of HCV-positive mothers developed anemia, a significantly higher rate than in healthy pregnant women (2.6%, p < 0.001). While our study did not assess this outcome variable directly, this factor may contribute to fetal growth restriction and warrants further investigation.

Although our study did not assess vertical transmission, Pinto et al (2021)[18] reported a 13.9% vertical transmission rate among HCV-positive pregnancies. In contrast, Chen et al. (2023)[16] found that while maternal HCV infection was associated with adverse neonatal outcomes, vertical transmission remained relatively low. These findings highlight the importance of universal screening, as recommended by Hughes et al (2017),[20] to identify and manage maternal HCV infections early.

One limitation of our study is the cross-sectional design, which prevents us from establishing causality. Additionally, we did not assess maternal viral load, which has been identified as a key predictor of neonatal outcomes in previous studies in addition to various other outcome variables including preterm birth, anemia etc. Future research should explore viral load quantification, placental pathology, and maternal nutritional status to better understand the mechanisms driving LBW in HCV-positive pregnancies.

CONCLUSION

Our study highlights a substantial burden of LBW among neonates born to HCV-positive mothers, with a frequency of 20.9%. Comparisons with previous studies suggest that maternal HCV infection contributes to fetal growth restriction, preterm labor, and potential vertical transmission risks. While some studies have found no association between HCV and adverse neonatal outcomes, most have reported increased risks of LBW, preterm birth, and maternal complications. Enhanced prenatal screening, monitoring, and tailored obstetric care are essential for improving pregnancy outcomes in HCV-positive women. Further prospective studies with viral load assessment are needed to elucidate the underlying mechanisms and optimize perinatal care strategies for this vulnerable population.

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