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Hepatitis C virus seroprevalence and active viremia among pregnant women at a tertiary care hospital in New Delhi

A. Panda[1], S. Kumar[1], V. Uppal[2], R. Bharti[3], D. Nair[1]

[1]Department of Microbiology, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India
[2]Department of Biochemistry, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India
[3]Department of Obstetrics and Gynecology, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India

ABSTRACT:

— ***Objective:*** Hepatitis C virus (HCV) infection is a major global public health problem and a leading cause of chronic liver disease and hepatocellular carcinoma. Pregnant women constitute an important group because of the risk of mother-to-child transmission, particularly in the presence of maternal viremia. This study aimed to determine the seroprevalence of HCV infection among pregnant women attending antenatal care at a tertiary care hospital in North India and to assess the proportion of seropositive women with active infection.

— ***Patients and Methods:*** This hospital-based cross-sectional study was conducted among 1,519 pregnant women attending antenatal clinics at a tertiary care hospital in New Delhi. Serum samples were screened for anti-HCV antibodies using an enzyme-linked immunosorbent assay. All seropositive samples were further evaluated for active infection by quantitative detection of HCV RNA using real-time polymerase chain reaction. Sociodemographic details and reported exposures were recorded descriptively.

— ***Results:*** Anti-HCV antibodies were detected in 9 of 1,519 pregnant women, yielding a seroprevalence of 0.59% (95% CI: 0.27%-1.12%). Detectable HCV RNA was present in 5 of 9 (55.56%; 95% CI: 21.2%-86.3%) seropositive women, with viral loads ranging from 50.5 to 2,110 IU/mL. Among the anti-HCV-positive women, commonly reported exposures included ear/nose piercing, dental procedures, tattooing, and prior blood transfusion.

— ***Conclusions:*** In this tertiary-care antenatal population, anti-HCV seroprevalence was low, and more than half of the seropositive women had detectable HCV RNA. These findings provide a local descriptive estimate of HCV serostatus and active viremia among pregnant women in one hospital-based setting.

— ***Keywords:*** Hepatitis C virus, Pregnancy, Seroprevalence, Antenatal population, HCV RNA.

Corresponding Author: Shilpee Kumar, MBBS, MD; e-mail: drshilpee17@yahoo.in

INTRODUCTION

Hepatitis C virus (HCV) infection affects millions of people worldwide and remains a major cause of chronic liver disease, cirrhosis, and hepatocellular carcinoma[1]. A major challenge in the control of HCV infection is its largely asymptomatic course during the early stages, which often leads to delayed diagnosis and continued transmission. In the absence of an effective vaccine, early detection and timely treatment remain the primary strategies for reducing disease burden[2].

Pregnant women represent a key population in HCV epidemiology. Although maternal HCV infection is usually asymptomatic, it carries a risk of mother-to-child transmission, which may result in chronic infection in the offspring[3]. The likelihood of vertical transmission is closely associated with detectable maternal viremia and higher viral loads[4].

In India, reported HCV seroprevalence ranges from 0.5% to 1.5%, with most data derived from blood donors and high-risk adult populations[5,6]. Data from antenatal settings are limited and show considerable regional variability[7-10]. Emerging evidence also suggests a potential association between HCV infection and metabolic complications during pregnancy, including gestational diabetes mellitus (GDM), the prevalence of which ranges from 3.8% to 17.9% in India[11,12].

The present study was conducted to estimate the seroprevalence of anti-HCV antibodies among pregnant women attending antenatal care at a tertiary care hospital in New Delhi and to determine the proportion of anti-HCV-positive women with detectable HCV RNA. Sociodemographic characteristics and reported exposures among seropositive women were recorded descriptively. The assessment of gestational diabetes mellitus was exploratory.

PATIENTS AND METHODS

Study Design and Setting

This hospital-based cross-sectional study was conducted over 18 months (July 2022-January 2024) in the Departments of Microbiology, Biochemistry, and Obstetrics and Gynecology at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India.

Study Population

A consecutive sampling method was used to recruit all eligible pregnant women attending antenatal clinics during the study period. Pregnant women receiving antiviral therapy for hepatitis C were excluded. Written informed consent was obtained from all participants prior to enrolment. All HCV-seropositive women were counseled regarding infection status, risk of vertical transmission, and need for postpartum evaluation.

Laboratory Investigations

Venous blood samples were collected under aseptic conditions. Serum samples were screened for anti-HCV antibodies using a commercial enzyme-linked immunosorbent assay (Medsource Ozolisa HCV ELISA; Medsource Ozone Biomedicals Pvt. Ltd., Haryana, India), based on a double-antigen sandwich principle, following the manufacturer's instructions. All samples testing positive for anti-HCV antibodies were further evaluated for active infection by quantitative detection of HCV RNA using real-time polymerase chain reaction. Samples were stored at -80°C. HCV RNA extraction was performed using the TRUPCR® Viral Nucleic Acid Extraction Kit, and viral load estimation was carried out using the TRUPCR® HCV Viral Load Kit version 1.1 (3B BlackBio Biotech India Ltd., Madhya Pradesh, India).

Gestational Diabetes Mellitus Screening

Screening for gestational diabetes mellitus was performed using a 75-g oral glucose tolerance test as per national guidelines. A 2-hour plasma glucose value ≥140 mg/dL was considered diagnostic of GDM[13].

Statistical Analysis

Data were analyzed using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as numbers and percentages, while continuous variables were summarized as mean ± standard deviation or median, as appropriate. The primary analysis was descriptive. Anti-HCV seroprevalence and the proportion of HCV RNA positivity among anti-HCV-seropositive women were reported with 95% confidence intervals. Subgroup comparisons were considered exploratory and interpreted cautiously because of the small number of seropositive cases. No inferential statistical thresholds were applied to subgroup comparisons; all such data are presented descriptively only.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Vardhman Mahavir Medical College and Safdarjung Hospital and conducted in accordance with the Declaration of Helsinki. Confidentiality of all participants was maintained, and written informed consent was taken from all participants.

RESULTS

The overall seroprevalence of HCV infection among the study population was 0.59% (9/1,519; 95% CI: 0.27%-1.12%). Among the seropositive pregnant women, 5 of 9 (55.56%; 95% CI: 21.2%-86.3%) had detectable HCV RNA, indicating active infection. The mean viral load among RNA-positive cases was 514.25 IU/mL (range: 50.5-2,110 IU/mL), corresponding to 1,581.31 copies/mL (range: 155.28-6,488.25 copies/mL). All HCV seropositive women were asymptomatic.

The distribution of anti-HCV seropositivity across participant characteristics is presented in Table 1. Among the 9 seropositive women, 5 were laborers, and 5 were illiterate; given the very small number of positive cases, no meaningful interpretation of these distributions was possible.

Commonly reported exposures among anti-HCV-positive women included ear/nose piercing, dental procedures, tattooing, and prior blood transfusion.

Gestational diabetes mellitus was diagnosed in 22 of 1,519 participants, none of the 9 anti-HCV-positive women had GDM; however, the study was underpowered to assess any association between HCV serostatus and GDM.

DISCUSSION

The World Health Organization[1] categorizes HCV antibody prevalence as high (>3.5%), moderate (1.5-3.5%), and low (<1.5%). India falls within the low endemicity category, with a reported national seroprevalence of approximately 0.32%[5].

In the present study, screening of 1,519 pregnant women attending antenatal clinics revealed an HCV seroprevalence of 0.59%, which is comparable to that reported in hospital-based studies from other regions of India (Table 2)[7-10,14-17]. Considerable variability in reported prevalence rates across studies may be attributed to differences in study populations, healthcare-seeking behavior, percutaneous risk exposures, and laboratory methods used.

In this study, detectable HCV RNA was identified in 55.56% of seropositive pregnant women, which is consistent with findings reported by Parthiban et al[4],

Table 1. Distribution of anti-HCV seropositivity across participant characteristics.

Parameter	Number of women screened for HCV (N)	Number of women seropositive for HCV (n)	Seroprevalence of HCV (%) (n/N*100)
Age (years)			
18-22	419	3	0.71
23-27	687	4	0.58
28-32	336	1	0.29
≥33	77	1	1.29
Occupation			
Labourer	302	5	1.65
Homemaker	921	4	0.43
Business	234	0	0
Students	62	0	0
Education status			
Illiterate	334	5	1.49
Primary school	520	3	0.57
High school	321	1	0.31
Higher secondary	225	0	0
Graduate	76	0	0
Post graduate	43	0	0
Parity			
Primipara	723	4	0.55
Multipara	796	5	0.62
OGTT			
≥140 mg/Dl	22	0	0
<140 mg/Dl	1,497	9	0.6
Total	1,519	9	0.59

Subgroup data are presented for descriptive purposes only. Given the very small number of anti-HCV-positive women (n=9), no statistical inference can be drawn from these distributions.
Hepatitis C virus (HCV), oral glucose tolerance test (OGTT).

Table 2. Research findings on the seroprevalence of HCV infection among pregnant women in India.

Study	Year	Location	Sample size	Seroprevalence (%)
Kumar et al[7]	2004-2006	Delhi	8,130	1.03%
Goyal et al[15]	2010-2013	Punjab	1,412	2.8%
Mehta et al[9]	2013	Gujarat	1,038	0.19%
Jindal et al[16]	2014	Punjab	717	4.8%
Pyadala et al[14]	2015	Telangana	1,381	0.21%
Malhotra et al[8]	2015-2016	Haryana	10,000	0.30%
Jahan et al[17]	2017-2018	Uttar Pradesh	345	1.7%
Yadav et al[10]	2018-2019	Uttar Pradesh	4,037	0.52%

Kumar et al[7], and Jindal et al[16]. Variations in HCV RNA positivity across studies may be influenced by pregnancy trimester, viral genotype, assay sensitivity, and sample handling. A positive anti-HCV antibody test with detectable RNA confirms active infection, whereas undetectable RNA may indicate resolved infection or low-level viremia below assay detection threshold.

Mother-to-child transmission of HCV has been reported to range from 0% to 35%[3,4]. Higher maternal viral loads, particularly above 6.0 $\log_{10}$ IU/mL, are associated with increased transmission risk[4,18]. The viral load levels observed in the present study were relatively low and comparable to other reports involving asymptomatic pregnant women[19].

The present study was insufficiently powered to assess any relationship between HCV serostatus and gestational diabetes mellitus, and no inference is drawn from the observation that none of the 9 seropositive women were diagnosed with GDM.

Limitations

This study has certain limitations. Being a hospital-based study conducted at a single tertiary care center, the findings may not be generalizable to the broader community. Pregnant women attending tertiary care hospitals may represent a higher risk group than the general antenatal population. The number of anti-HCV-positive women was very small, limiting the precision of estimates and precluding meaningful subgroup analyses. Data regarding risk factors were collected using patient questionnaires, which may be subject to recall bias and underreporting of socially sensitive behaviors. Important clinical parameters such as pregnancy trimester, maternal weight gain, and history of metabolic disorders were not evaluated, which could have influenced the assessment of gestational diabetes mellitus. Follow-up of mothers and infants after delivery was not undertaken. Consequently, HCV RNA testing in infants and assessment of actual mother-to-child transmission rates could not be performed. The small number of HCV-seropositive cases also limited the ability to draw definitive conclusions regarding associations with gestational diabetes mellitus and other clinical outcomes. HCV genotyping was not performed, limiting our understanding of the circulating strains and their potential clinical implications.

The principal contribution of this work is a regional descriptive estimate of anti-HCV seroprevalence among antenatal women at a tertiary care hospital in New Delhi, with virological confirmation of active infection among seropositive women.

CONCLUSIONS

In this single-center, hospital-based cross-sectional study of 1,519 antenatal attendees, anti-HCV seroprevalence was 0.59% (95% CI: 0.27%-1.12%), and 5 of 9 (55.56%; 95% CI: 21.2%-86.3%) seropositive women had detectable HCV RNA. The study provides a regional descriptive estimate of anti-HCV seroprevalence with virological confirmation of active infection among seropositive women at one tertiary care hospital in New Delhi. The small number of seropositive cases, the single-center design, and the absence of follow-up preclude broader generalizations.

Authors' Contributions:
Arpita Panda was primarily responsible for the execution of the study, including data collection, analysis, interpretation, and preparation of the initial draft.
Shilpee Kumar contributed to data acquisition, provided critical scientific inputs, conceptualized the study, supervised all stages of the research, critically reviewed the data and manuscript for intellectual content, and approved the final version.
Deepthi Nair provided resources, supervision, validation, and reviewed and edited the manuscript.
Rekha Bharti and Vibha Uppal provided critical scientific inputs, validation, and conceptualized the study.

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Conflict of Interest:
The authors declare that there is no conflict of interest.

Ethics Approval:
The study was approved by the Institutional Ethics Committee of VMMC-SJH (IEC/VMMC/SJH/Thesis/06/2022/CC-137) on 11.07.2022

AI Disclosure:
An artificial intelligence tool (ChatGPT) was used solely for language editing and grammar improvement. No AI tool was used for data analysis, interpretation, or generation of scientific content. The authors take full responsibility for all content of this manuscript.

Data Availability:
The datasets analyzed during the current study are available from the corresponding author on reasonable request, subject to institutional ethics and confidentiality.

ORCID ID:
Arpita Panda: 0009-0008-0020-1837
Shilpee Kumar: 0000-0002-8123-2350
Vibha Uppal: 0000-0001-6697-7496
Rekha Bharti: 0000-0001-9737-8365
Deepthi Nair: 0000-0001-6538-2992

Informed Consent:
Confidentiality of all participants was maintained and written informed consent was taken from all participants.

References

1. World Health Organization. Hepatitis C. Fact sheet. Geneva: WHO; 2023.
2. Ministry of Health and Family Welfare Government of India. Diagnosis and management of viral hepatitis. National guidelines. 2018.
3. Kushner T, Reau N. Changing epidemiology, implications, and recommendation for hepatitis C in women of child-bearing age and during pregnancy. J Hepatol 2020; 74: 734-741.
4. Parthiban R, Shanmugam S, Velu V, Nandakumar S, Dhevahi E, Thangaraj K, Nayagam SK, Karthick J, Murugavel KG, Balakrishnan P, Solomon S. Transmission of hepatitis C virus infection from asymptomatic mother to child. Int J Infect Dis 2009; 13: 394-400.
5. Puri P, Anand AC, Saraswat VA, Acharya SK, Dhiman RK, Aggarwal R, Naik S, Bhalla A, Sarin SK, Mukhopadhya A, Chowdhury A, Batra Y, Das K, Sood A, Singh SP, Bansal R, Sakhuja P. Consensus statement of HCV Task Force of the Indian National Association for Study of the Liver. J Clin Exp Hepatol 2014; 4: 106-116.
6. Goel A, Seguy N, Aggarwal R. Burden of hepatitis C virus infection in India: A systematic review and meta-analysis. J Gastroenterol Hepatol 2019; 34: 321-329.
7. Kumar A, Sharma KA, Gupta RK. Prevalence and risk factors for hepatitis C virus among pregnant women. Indian J Med Res 2007; 126: 421-425.
8. Malhotra P, Nanda S, Malhotra V, Chauhan M, Chugh A. Prevalence of HIV, hepatitis B and C in pregnancy. Adv Res Gastroenterol Hepatol 2016; 1: 80-82.
9. Mehta KD, Antala S, Mistry M, Goswami Y. Seropositivity of hepatitis B, hepatitis C, syphilis, and HIV in antenatal women. J Infect Dev Ctries 2013; 7: 832-837.
10. Yadav K, Verma P, Mishra PK, Yadav SK, Tripathi SK. Seroprevalence of hepatitis B and C among antenatal women. J Pure Appl Microbiol 2022; 16: 435-440.
11. Raja MW, Baba TA, Hanga AJ, Rasheed S, Haq IU. A study to estimate the prevalence of gestational diabetes in an urban block of Kashmir Valley. Int J Med Sci Public Health 2014; 3: 191-195.
12. Pergam SA, Wang CC, Gardella CM, Sandison TG, Phipps WT, Hawes SE. Pregnancy complications associated with hepatitis C: Data from a 2003-2005 Washington state birth cohort. Am J Obstet Gynecol 2008; 199: 38.e1-38.e9.
13. Ministry of Health and Family Welfare Government of India. Diagnosis and management of gestational diabetes mellitus. National guidelines. 2014.
14. Pyadala N, Maity SN, Kothapalli JK, Goud AK, Borugadda R, Mallepaddi PC, Polavarapu R. Seroprevalence of HCV infection among pregnant women in a rural teaching hospital, Sangareddy. Int J Res Dev Pharm L Sci 2006; 5: 2251-2254.
15. Goyal LD, Kaur S, Jindal N, Kaur H. HCV and pregnancy: Prevalence, risk factors, and pregnancy outcome in north Indian population: A case-control study. J Obstet Gynaecol India 2014; 64: 332-336.
16. Jindal N, Goyal LD, Singh C. Sociodemographic features associated with Hepatitis C Virus (HCV) in pregnant females: A tertiary care centre study from Malwa region of Punjab (North India). J Family Med Prim Care 2021; 10: 2679-2683.
17. Jahan G, Jahan N, Rungta S, Ahmad A. Seroprevalence and risk factors of hepatitis B and C infections among pregnant women. Int J Res Med Sci 2020; 8: 1718-1723.
18. Marine-Barjoan E, Berrebi A, Giordanengo V, Favre SF, Haas H, Moreigne M, Izopet J, Tricoire J, Tran A, Pradier C, Bongain A. HCV/HIV co-infection, HCV viral load and mode of delivery: Risk factors for mother-to-child transmission of hepatitis C virus? AIDS 2007; 21: 1811-1815.
19. Paternoster DM, Santarossa C, Grella P, Palu G, Baldo V, Boccagni P, Floreani A. Viral load in HCV RNA positive pregnant women. Am J Gastroenterol 2001; 96: 2751-2754.