

ORIGINAL ARTICLE

Seroprevalence and Risk Factors for Hepatitis B and C infection among pregnant women attending a government hospital in Delhi

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ABSTRACT

Background: Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infection during pregnancy is associated with perinatal transmission contributing to the pool of HBV and HCV infection. Pregnant women with chronic hepatitis B and positive Hepatitis B virus E antigen (HBeAg) have a 90% likelihood of transmitting the hepatitis B virus to their newborns. Vertical (mother-to-child) transmission is the leading cause of HCV infection in children. Though there is much data on the overall prevalence of HBV and HCV infection among the general population, only a few studies are focusing on the seroprevalence of HBV and HCV among pregnant women. **Methodology:** A cross-sectional, descriptive study conducted in Delhi. A total of 422 pregnant women attending the antenatal clinic for the first time were interviewed for risk factors for transmission and then tested for HBsAg and anti-HCV using rapid diagnostic test kit. **Results:** The seroprevalence for HBsAg and anti-HCV among the participants was 2.1% and 0.2%, respectively. Risk factor assessment revealed a significant association with the history of blood or blood product transfusion. **Conclusion:** Prevalence rates for HBsAg are higher than those reported in some previous studies and the national average. More in-depth research studies are needed to identify potential risk factors significantly contributing to the disease burden for the targeted approach to eliminate infection.

KEYWORDS

Hepatitis B; Hepatitis C; Seroprevalence; Risk Factors

INTRODUCTION

Hepatitis is an inflammation of the liver caused by various infectious viruses and non-infectious agents.⁽¹⁾ There are five main strains of the hepatitis virus, referred to as types A, B, C, D and E. They all cause liver disease but differ in important ways, including

modes of transmission, severity of illness, geographical distribution and prevention methods. In particular, hepatitis B and C lead to chronic disease for hundreds of millions of people and together are the most common cause of liver cirrhosis, liver cancer and hepatitis-related deaths. The World Health

Organization estimated that in 2022, there were around 254 million people living with Hepatitis B and 50 million with Hepatitis C worldwide. Additionally, Hepatitis B and C were responsible for approximately 1.1 million and 240,000 deaths, respectively, in the same year.(2) Hepatitis B spread through parenteral and sexual routes. Transfusion of blood and blood products, sharing needles during injection drug use, needlesticks injuries, and injuries caused by various instruments in healthcare settings, as well as hemodialysis, all represent instances of parenteral and percutaneous exposures. However, parenteral mode remains the dominant mode of transmission worldwide. Additionally, perinatal transmission is possible, particularly in infants born to HBeAg-positive women, where the infants would have a 70% to 90% likelihood of infection. Of those infected perinatally, 90% develop a chronic hepatitis B virus infection. HCV Transmission can happen through parenteral, perinatal, and sexual routes, with the predominant mode being the sharing of contaminated needles among intravenous drug users.(3) About 8% of pregnant women globally are infected with HCV.(4)

In India, 40 million people are chronically infected with Hepatitis B, and 6 to 12 million people are chronically infected with Hepatitis C. India harbors 10% to 15% of the global pool of HBV of whom 15% to 25% develop cirrhosis and complications leading to health care costs and premature death. Of the 26 million infants born each year, 1 million run a lifetime risk for HBV infection.(5) National seroprevalence of Hepatitis B was 0.95% (0.89-1.01) and National seroprevalence of Hepatitis C was 0.32% (0.28-0.36) based on NFHS 4.(6) Pregnancy-related HBV and HCV infections are associated with a high risk of vertical transmission and complications for the mother as well as the newborn. Hence this study was undertaken to determine the seroprevalence as well as associated risk factors for Hepatitis B and C infection among pregnant women attending a government hospital in Delhi.

MATERIAL & METHODS

It was a descriptive cross-sectional study conducted in a district hospital in South Delhi for over a period of 3 months from July to October 2023. The hospital was selected based on the purposive sampling. The target population included antenatal women attending the Obstetrics and Gynaecology Outpatient Department (OPD). All consecutive pregnant women attending the Obstetrics and Gynaecology OPD for their first antenatal check-up during the three-month study period were eligible and those who provided consent were included in the study.

A total of 422 pregnant women attending the antenatal clinic during this period were interviewed using a semi structured interview schedule to collect data on sociodemographic profile, obstetric history and risk factors for transmission and subsequently tested for HBsAG. using AbChek One Step Rapid Test, which is a lateral flow chromatographic immunoassay, and the specific antibodies to HCV by using STANDARD Q HCV Ab rapid test, which is a rapid chromatographic immunoassay for the qualitative detection of specific antibodies. Results were communicated to the pregnant women through reports and were sent to obstetrics and gynaecology OPD for further management.

The data was analysed using IBM SPSS Version 26 software. The chi-square test was applied to find out the association between independent and dependent variables as per the objectives of the study.

Ethical consideration: Approval from the Institutional Ethics Committee was obtained before conducting the study.

RESULTS

Sociodemographic profile and obstetric history of pregnant women

Out of 422 participants, the majority of pregnant women (79.4%) were within the age group of 20-30 years. In terms of education, 20.6% had no formal education, 19.4% had completed primary education, 20.1% had completed secondary education, 19.9% had completed senior secondary education, and about 20% were graduate and above.

Regarding occupation, only (2.1%) of participants were employed, while the majority (97.9%) were unemployed. Most of the women belonged to the general caste

(63.7%), 24.6% in the OBC category, and 11.6% in the SC/ST category. Among the participants 69.0% were Hindu, and 29% were Muslim.

Table 1: Sociodemographic profile and obstetric history of pregnant women (n=422)

Characteristics	Number	Percent
Age group		
<19	29	6.9
20-30	335	79.4
>31	58	13.7
Education status		
No Formal education	87	20.6
Primary	82	19.4
Secondary	85	20.1
Senior Secondary	84	19.9
Graduate	71	16.8
Postgraduate	13	3.1
Occupation		
Employed	9	2.1
Unemployed	413	97.9
Caste		
General	269	63.7
OBC	104	24.6
SC/ST	49	11.6
Religion		
Hindu	291	69
Muslim	122	28.9
Sikh	4	0.9
Christian	5	1.2
Gestational Age		
1st Trimester	255	60.4
2nd Trimester	136	32.2
3rd Trimester	31	7.3
Gravida		
Primigravida	192	45.5
Multigravida	230	54.5

The majority of participants (60.4%) were in the 1st trimester, followed by 32.2% in the 2nd trimester and a smaller proportion (7.3%) in the 3rd trimester. Regarding gravida, 45.5% were primigravida (first-time pregnant), while 54.5% were multigravida (having been pregnant before) (Table 1).

Seroprevalence and Risk Factors for Hepatitis B And C Infection in Pregnant Women

Risk factor assessment for Hepatitis B and C infection in pregnant women revealed that 2.4% had a history of past surgery, 11.4% had undergone dental procedures, 4.0% had received blood or blood product transfusion, and 4.7% reported a history of abortion. Tattooing was reported by 16.4%, while sexual

contact was extremely rare at 0.2%. Additionally, 4.7% reported jaundice in their family, and only 0.5% had a family history of Hepatitis B or C.(Table 2)

Table 2: Distribution of risk factors for Hepatitis B And C Infection among pregnant women (n=422)

Risk Factors	Number	Percent
Past Surgery		
Yes	10	2.4
No	412	97.6
Dental Procedure		
Yes	48	11.4
No	374	88.6
Blood/Blood product transfusion		

Risk Factors	Number	Percent
Yes	17	4
No	405	96
Abortion		
Yes	20	4.7
No	402	95.3
Tattooing		
Yes	69	16.4
No	353	83.6
Sexual contact		
Yes	1	0.2
No	421	99.8
Jaundice in Family		
Yes	20	4.7
No	402	95.3
Hepatitis B or C in Family		
Yes	2	0.5
No	420	99.5
Piercing		
Yes	421	99.8
No	1	0.2

Seroprevalence & Risk Factors

Out of 422 participants, 9 women were found to be HBsAg positive, and 1 tested positive for anti-HCV, resulting in seroprevalence rates of 2.1% for HBsAg and 0.2% for anti-HCV. A significant association was noted between HBsAg positivity and a history of blood or blood product transfusion, with a p-value of 0.005 indicating statistical significance (Table 3 and 4).

Table 3 Seroprevalence of Hepatitis B(HBsAg) and Hepatitis C (anti HCV) in pregnant women (n=422)

	Number	Percent
Hepatitis B (HBsAg)		
Positive	9	2.1
Negative	413	97.9
Hepatitis C (anti-HCV)		
Positive	1	0.2
Negative	421	99.8

Table 4 Risk factors associated with Hepatitis B infection among pregnant women.

Risk Factors	HBsAg positive (n, %)	HBsAg negative (n, %)	p-value
Dental Procedure	1(11.1)	47(11.4%)	0.98
Blood/Blood product transfusion	2(22.2)	15(3.6)	0.005*
Tattooing	1((11.1)	68(16.5)	0.667
Piercing	9(100.0)	412(99.8)	0.883

*p value <0.05 significant, total percent may not be 100 due to multiple response

Association of sociodemographic factors and obstetric history with participants who tested positive and negative for hepatitis B (HBsAg) and hepatitis C (anti-HCV).

All hepatitis B-positive cases were found in the 20-30 age group, but no significant associations were observed across different

age group, education levels, occupation, caste, religion, gestational age, or gravid status for either hepatitis B or C. Both hepatitis B and C cases were more prevalent among the unemployed, majority of hepatitis B cases were in the second trimester of pregnancy. However, none of these factors showed statistically significant associations.(Table 5)

Table 5: Association of Hepatitis B and C positive infection with sociodemographic characteristics and obstetric history.

Characteristics	Hepatitis B positive (n, %)	Hepatitis B negative (n, %)	p-value	Hepatitis C positive (n, %)	Hepatitis C negative (n, %)	p-value
Age group						
<19	0(0.0)	29 (7.0)	0.303	0	29(6.9)	0.878
20-30	9(100.0)	326(78.9)		1(100.0)	334(79.3)	
>31	0(0.0)	58(14.0)		0	58(13.8)	
Education status						
No Formal education	2(22.2)	85(20.6)	0.975	0	87(20.7)	0.545

Characteristics	Hepatitis B positive (n, %)	Hepatitis B negative (n, %)	p- value	Hepatitis C positive (n, %)	Hepatitis C negative (n, %)	p- value
Primary	1(11.1)	81(19.6)		0	82(19.5)	
Secondary	2(22.2)	83(20.1)		0	85(20.2)	
Senior Secondary	2(22.2)	82(19.9)		1(100.0)	83(19.7)	
Graduate	2(22.2)	69(16.7)		0	71(16.9)	
Postgraduate	0(00)	13(3.1)		0	13(3.1)	
Occupation						
Employed	0(0.0)	9(2.2)	0.654	0	9(2.1)	0.883
Unemployed	9(100.0)	404(97.8)		1(100.0)	412(97.9)	
Caste						
General	7(77.8)	262(63.4)	0.503	1(100.0)	268(63.7)	0.752
OBC	2(22.2)	102(24.7)		0	104(24.7)	
SC/ST	0	49(11.9)		0	49(11.6)	
Religion						
Hindu	9(100.0)	283(68.5)	0.251	1(100.0)	291(69.1)	0.931
Muslim	0	121(29.3)		0	121(28.7)	
Sikh	0	4(1.0)		0	4(1.0)	
Christian	0	5(1.2)		0	5(1.2)	
Gestational Age						
1st Trimester	3(33.3)	252(61.0)	0.075	0(0.0)	255(60.6)	0.349
2nd Trimester	6(66.7)	130(31.5)		1(100.0)	135(32.1)	
3rd Trimester	0(0.0)	31(7.5)		0(0.0)	31(7.4)	
Gravid						
Primigravida	3(33.3)	189(45.8)	0.459	0(0.0)	192(45.6)	0.36
Multigravida	6(66.7)	224(54.2)		1(100.0)	229(54.4)	

DISCUSSION

In our study, 422 pregnant women were assessed for various risk factors to elucidate potential factors associated with Hepatitis B and C transmission. Results revealed that among Hepatitis B-positive pregnant women, 11.1% had a history of undergoing dental procedures, 22.2% had received blood or blood product transfusion, and tattooing in 11.1% of cases. Risk factors such as abortion, history of jaundice or Hepatitis B and C in the family, sexual contact, and past surgery were not present in any of the positive cases. Similar findings were also reported in a study conducted by Kumar et al. (7) in Delhi, in which out of 8130 pregnant women, 257 (3.2%) received a blood transfusion before the index pregnancy, 1114 (13.7%) reportedly underwent D&C, 839 (10.3%) had tattoo application which is slightly lower than our study. None of the women declared that they had multiple sexual partners or ever injected drugs; the same findings were found in our study. In our study, a single case of anti-HCV positivity was identified, with piercing as the sole risk factor. A significant association was

seen between HBsAg positivity and blood and blood product transfusion ($p=0.005$). The association between blood transfusion and positive infection was consistent with previous studies conducted by Gedefaw et al. (8) from Ethiopia and Israr et al. (9) from Pakistan and Mittal et al. (10). Similarly, in a study by Upreti et al. (11) history of major surgery, previous abortion, and blood transfusion were highlighted as risk factors among anti-HCV-positive pregnant women.

The present study found that the seroprevalence for HBsAg was 2.1%, and for anti-HCV was 0.2%. In a study by Rajendiran et al (12) prevalence for HBsAg among pregnant women in South India was found to be 1.01%, 0.4% reported by Pandey et al. (13), 1.11% by Sibia et al. (14) in northern India and 0.9% by Dwivedi et al. (15) which were lower than the prevalence in our study. According to WHO, the prevalence of HBsAg in India is 3-4.2%. (16) According to factsheet based on NFHS 4, the national average for HBsAg is 0.95, which is again lower than the prevalence in our study. A study by Kumar et al. (7) showed this

prevalence of 4.8% for HBsAg and for anti-HCV to be at 1.03%, Goyal *et al.* (17) reported a prevalence of 2.8% for anti-HCV, 0.5% by Jahan N *et al.* (18). Another study from Uttarakhand by Upreti *et al.* (11) also reported prevalence of 0.89% among pregnant women. In a study by Mittal *et al.* (10) the seroprevalence of HBsAg was found to be 2.8% and of anti-HCV antibodies 1.8% in the general population, which all are higher than our study. The result was similar to the systematic review by Giri *et al.* (19) which showed a prevalence of 1.6%.

In this study, all the HBsAg and anti-HCV-positive pregnant women were in the 20-30 age group. Similar findings were also observed in a study conducted by Upreti *et al.* (11) in which most HCV-positive women were in the 20-25 age group. In a study by Rajendiran *et al.* (12) also, the majority of HBsAg-positive women were in the 26-30 years age group. This can be explained by the greater probability of exposure to risk factors for women in this age group. Variations in prevalences among pregnant women observed may be attributed to differences in geographical settings and study methodologies adopted. Most of our study's HBsAg-positive women (66.7%) were multigravida. Multigravida can be at higher risk due to their past pregnancies, obstetric procedures, and blood transfusions. This finding was similar to the study conducted by Ugbebor *et al.* (20)

No significant association was observed between education status, occupation status, caste, and religion with Hepatitis B positivity. However, data suggests that unemployed individuals have a higher prevalence of both Hepatitis B and Hepatitis C while vice versa for the employed group, which could be due to a high level of awareness in the employed group for Hepatitis B and C infection. Similarly, for hepatitis C, no significant association was found with all the demographic indicators.

CONCLUSION

To conclude, the seroprevalence of HBsAg and anti-HCV in the study population is 2.1% and 0.2% respectively. Seroprevalence rates for HBsAg are higher than those reported in some previous studies and the national average.

Blood transfusion showed a significant association with Hepatitis B positivity among the explored risk factors for Hepatitis B and C infections emphasizing the need for strict blood safety measures.

RECOMMENDATION

More in depth research studies are needed to identify potential risk factors significantly contributing to the disease burden for the targeted approach to eliminate infection

LIMITATION OF THE STUDY

Since the study was conducted exclusively among pregnant women in Delhi, the results may not be generalizable to pregnant women across India. The study was limited by its inability to employ more sensitive diagnostic techniques, such as polymerase chain reactions.

RELEVANCE OF THE STUDY

The study provides updated seroprevalence data for hepatitis B and C among pregnant women in Delhi, contributing to regional epidemiological insights. Blood transfusion remains a significant risk factor, emphasizing the need for stringent blood safety regulations

AUTHORS CONTRIBUTION

All authors have contributed equally.

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Nil

CONFLICT OF INTEREST

There are no conflicts of interest.

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DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process

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