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Original Article

Seropositivity of Hepatitis B Surface Antigen (HBsAg) Among Pregnant Women Attending a Tertiary Care Hospital in Bangladesh

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ABSTRACT

Background: Hepatitis B virus (HBV) infection is a major public health problem in pregnancy due to the potential for perinatal transmission and poor maternal and neonatal outcomes. This study aimed to assess the seropositivity of HBsAg among pregnant women attending a tertiary care hospital. **Methods & Materials:** This descriptive cross-sectional study was carried out at the Department of Microbiology, Ashiyan Medical College & Hospital, Dhaka, Bangladesh from January 2025 to December 2025 on 130 pregnant women. Participants were recruited through consecutive sampling after informed consent, and empirical data were collected using a structured questionnaire that included sociodemographic, obstetric, clinical, and exposure-related data. The HBsAg was tested in venous blood samples, and the association with seropositivity was evaluated with the chi-square test, with $p<0.05$ being statistically significant. **Results:** The overall seropositivity of HBsAg was 5.4% (7/130). There were no statistically significant differences between HBsAg positivity and age, residence, gravidity, attendance at antenatal care, or history of miscarriage ($p>0.05$). Significant associations were observed with previous blood transfusion (21.4% vs 3.4%, p=0.027), family history of hepatitis B (25.0% vs 3.4%, p=0.017), a known HBsAg-positive husband (40.0% vs 4.0%, p=0.023), and history of jaundice (25.0% vs 4.1%, p=0.049). **Conclusions:** The HBsAg seropositivity of pregnant women in this tertiary care center is intermediate and blood transfusion history, family history of hepatitis B, spousal HBsAg positivity, and previous jaundice are associated factors with HBsAg seropositivity.

Keywords: *Hepatitis B surface antigen; Pregnancy; Sero-positivity; Antenatal care*

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INTRODUCTION

Hepatitis B virus (HBV) infection remains one of the most significant vaccine-preventable causes of chronic liver disease in the world, and pregnant women are a vulnerable group due to the potential for mother-to-child transmission of the virus during pregnancy, delivery, and the postpartum period [1]. The overall burden of HBV in the general population in endemic areas like South Asia, including Bangladesh, is still in the intermediate endemicity range, and HBsAg prevalence in the general population and among specific risk groups is still widely variable by age, geographic location, and exposure history [2]. Pooled HBsAg seroprevalence among pregnant women is highly variable in neighboring endemic settings, depending on the population studied and the screening strategy used. Since most chronic HBV infections occur perinatally or during early childhood, screening of pregnant women for HBsAg is regarded as one of the most effective public-health measures to reduce the burden of future disease, as the risk of chronic carriage is significantly reduced when hepatitis B immunoglobulin and birth-dose vaccination are administered to exposed neonates at the appropriate time [3]. Various sociodemographic, obstetric, and behavioral factors have been reported to affect HBsAg seropositivity in pregnant women. In Northern Ethiopia, associations were found between HBsAg positivity and maternal age, parity, and history of invasive medical procedures (dental extraction and surgery) [4]. Likewise, an institution-based study in Northwest Ethiopia showed that the risk of HBV infection was significantly increased in women who had been admitted to hospital [5]. A history of blood transfusion and unsafe injection practices were also found to be significant factors in seropositivity in North Africa, even after controlling for age and parity [6]. Community-level evaluations of maternal knowledge about mother-to-child transmission of hepatitis B in West Africa have revealed a lack of awareness of the risk of transmission and the need for preventive vaccination, highlighting the need for antenatal screening programs to promote awareness in addition to detection [7]. East African data also indicate that health-facility exposure, such as previous hospital admission and history of tattooing, are also persistent correlates of HBsAg positivity in the antenatal population [8]. A study conducted in a tertiary hospital in India reported significantly lower seroprevalence rates, reflecting the wide variation in estimates even in similarly resourced settings, depending on the level of screening coverage and community awareness [9]. Ethiopian referral-hospital cohorts also support the clinical exposure history, such as invasive antenatal or surgical procedures, and spouse's hepatitis B infection status, as the most consistent and strongest correlates of maternal HBsAg seropositivity in various healthcare settings [10,11]. Although a large volume of international literature has been published, information on HBsAg seroprevalence and associated factors among pregnant women attending tertiary care hospitals in Bangladesh is limited. This study was therefore conducted to assess the Sero-positivity of HBsAg and to explore the relationship between sociodemographic, obstetric, clinical, and exposure-related factors and HBsAg seropositivity in pregnant women attending a tertiary care hospital in Bangladesh.

METHODS & MATERIALS

This cross-sectional study was carried out at the Department of Microbiology, Ashiyan Medical College & Hospital, Dhaka, Bangladesh from January 2025 to December 2025. A total of 130 pregnant women were enrolled using a consecutive sampling technique after obtaining informed written consent and institutional ethical approval. Women who attended antenatal care or were admitted for delivery during the study period and who gave consent were included, while women who refused consent, women with incomplete clinical records, and women with a previous diagnosis of chronic liver disease

(not related to hepatitis B) were excluded. A pre-tested, structured questionnaire was used to collect data, which was completed by face-to-face interview, with review of antenatal and hospital records. The variables studied were sociodemographic (age, residence, educational status, occupation), obstetric (gestational trimester, gravidity, parity, attendance at antenatal care, history of miscarriage, history of caesarean delivery), clinical and laboratory profile (history of jaundice, symptoms suggestive of liver disease, hepatomegaly, haemoglobin level, serum alanine aminotransferase), and hepatitis B exposure and vaccination-related variables (history of blood transfusion, surgical or dental procedures, family history of hepatitis B, husband's HBsAg status, tattooing or body piercing, previous hospital admission, and vaccination status). Venous blood was collected and tested for HBsAg by a standard screening assay; confirmatory testing was done for samples that were reactive. The data were entered and analyzed using SPSS software (version 26). Categorical variables were summarized as frequencies and percentages, and associations between HBsAg seropositivity and the sociodemographic, obstetric, and exposure-related variables were determined using the chi-square test or Fisher's exact test (where applicable); a p-value of less than 0.05 was considered statistically significant.

RESULTS

Table I shows the sociodemographic profile of the 130 pregnant women studied. The age group of 25 to 29 years old (39.2%) had the largest number of participants, followed by 30 years old and above (30.8%) and 24 years old and younger (30%). Over half lived in urban areas (58.5%) and 41.5% lived in rural areas. Almost half (45.4%) had secondary level education, followed by higher secondary or above (28.5%) and no formal/primary education (26.2%). The majority of women were homemakers (72.3%) and 27.7% were working or self-employed.

Table I
Sociodemographic characteristics of the study participants, *n* = 130.

Variable	Category	n (%)
Age group, years	≤24	39 (30.0)
	25–29	51 (39.2)
	≥30	40 (30.8)
Residence	Urban	76 (58.5)
	Rural	54 (41.5)
Educational status	No formal or primary education	34 (26.2)
	Secondary education	59 (45.4)
	Higher secondary or above	37 (28.5)
Occupation	Homemaker	94 (72.3)
	Employed or self-employed	36 (27.7)

The obstetric characteristics of the participants are presented in *Table II*. Over half (53.1%) were in their third trimester, followed by second trimester (33.1%) and first trimester (13.8%). The multigravida women accounted for 63.1% of the sample and 47.7% were para 1-2. The majority of women (70.8%) attended antenatal care regularly, and 29.2% attended irregularly. 19.2% of participants reported a history of previous miscarriage, and 31.5% had a history of previous caesarean delivery, with the rest having no history of such deliveries.

Table II
Obstetric characteristics of the study participants, *n* = 130.

Variable	Category	n (%)
Gestational trimester	First trimester	18 (13.8)
	Second trimester	43 (33.1)
	Third trimester	69 (53.1)
Gravidity	Primigravida	48 (36.9)
	Multigravida	82 (63.1)
Parity	Nulliparous	51 (39.2)
	Para 1-2	62 (47.7)
	Para ≥3	17 (13.1)
Antenatal-care attendance	Regular	92 (70.8)
	Irregular	38 (29.2)
Previous miscarriage	Yes	25 (19.2)
	No	105 (80.8)
Previous caesarean delivery	Yes	41 (31.5)
	No	89 (68.5)

The clinical and laboratory data of participants are summarized in *Table III*. Sixty-two percent of women had a history of jaundice, and 7.7% had symptoms suggestive of liver disease. On examination, only 3.1% had hepatomegaly. Anaemia (Hb < 11 g/dL) was prevalent in the study population (51.5%). 8.5% of women had elevated serum alanine aminotransferase (ALT) levels above 40 U/L, and most (91.5%) had normal ALT levels.

Table III
Clinical and laboratory profile of the study participants, *n* = 130.

Variable	Category	n (%)
History of jaundice	Yes	8 (6.2)
	No	122 (93.8)
Symptoms suggestive of liver disease	Present	10 (7.7)
	Absent	120 (92.3)
Hepatomegaly on examination	Present	4 (3.1)
	Absent	126 (96.9)
Anaemia, haemoglobin <11 g/dL	Present	67 (51.5)
	Absent	63 (48.5)
Elevated serum ALT, >40 U/L	Present	11 (8.5)
	Absent	119 (91.5)

The participants' characteristics related to hepatitis B exposure and vaccination are described in *Table IV*. A small proportion had previous blood transfusion (10.8%), surgical procedures (22.3%) or dental procedures (29.2%). Family history of hepatitis B was reported in 9.2% and 3.8% had husbands who were known to be HBsAg-positive. 14.6% reported having been tattooed or having had non-routine body piercing and 26.2% had had a previous hospital admission. As for vaccination status, 17.7% were fully vaccinated, 23.8% were partially vaccinated, 43.1% were unvaccinated, and 15.4% had unknown vaccination status.

Table IV
Hepatitis B exposure and vaccination profile of the study participants, *n* = 130.

Variable	Category	n (%)
Previous blood transfusion	Yes	14 (10.8)
	No	116 (89.2)
Previous surgical procedure	Yes	29 (22.3)
	No	101 (77.7)
Previous dental procedure	Yes	38 (29.2)
	No	92 (70.8)
Family history of hepatitis B	Yes	12 (9.2)
	No	118 (90.8)
Known HBsAg-positive husband	Yes	5 (3.8)
	No or status unknown	125 (96.2)
Tattooing or non-routine body piercing	Yes	19 (14.6)
	No	111 (85.4)
Previous hospital admission	Yes	34 (26.2)
	No	96 (73.8)
Hepatitis B vaccination status	Fully vaccinated	23 (17.7)
	Partially vaccinated	31 (23.8)
	Unvaccinated	56 (43.1)
	Vaccination status unknown	20 (15.4)

Table V shows the overall seropositivity of HBsAg among the study participants. A total of 130 pregnant women were screened; 7 (5.4%) were positive for HBsAg and 123 (94.6%) were negative. The finding suggests that the antenatal population attending this tertiary care hospital has an intermediate level of HBV endemicity and serves as a baseline for the associations that are discussed in the following tables.

Table V
Observed seropositivity of HBsAg among the study participants, *n* = 130.

Variable	Category	n (%)
HBsAg status	Positive	7 (5.4)
	Negative	123 (94.6)

The differences in the distribution of HBsAg status by sociodemographic and obstetric variables are presented in *Table VI*. The prevalence of HBsAg positivity was numerically higher in women aged 30 years or older (10.0%) than in women under 30 years (3.3%) and in rural residents (7.4%) than in urban residents (3.9%), but the differences were not statistically significant ($p>0.05$). Likewise, multigravida women, women who did not attend antenatal care regularly and women with a history of miscarriage had higher (but not significant) positivity rates than women who were not.

Table VI
Distribution of HBsAg status according to sociodemographic and obstetric characteristics, *n* = 130.

Variable	Category	HBsAg positive, n (%)	HBsAg negative, n (%)	p-value
Age group, years	<30	3 (3.3)	87 (96.7)	0.201
	≥30	4 (10.0)	36 (90.0)	
Residence	Urban	3 (3.9)	73 (96.1)	0.448
	Rural	4 (7.4)	50 (92.6)	
Gravidity	Primigravida	1 (2.1)	47 (97.9)	0.259
	Multigravida	6 (7.3)	76 (92.7)	
Antenatal-care attendance	Regular	3 (3.3)	89 (96.7)	0.193
	Irregular	4 (10.5)	34 (89.5)	
Previous miscarriage	Yes	3 (12.0)	22 (88.0)	0.129
	No	4 (3.8)	101 (96.2)	

The associations between HBsAg status and clinical or exposure-related characteristics are shown in Table VII. Statistically significant associations were observed for previous blood transfusion (21.4% vs 3.4%, p=0.027), family history of hepatitis B (25.0% vs 3.4%, p=0.017), a known HBsAg-positive husband (40.0% vs 4.0%, p=0.023), and history of jaundice (25.0% vs 4.1%, p=0.049). The positivity rates for previous dental procedure, vaccination status and high serum ALT were higher but not statistically significant in exposed women (p>0.05).

Table VII
Distribution of HBsAg status according to selected clinical and exposure-related characteristics, *n* = 130.

Variable	Category	HBsAg positive, n (%)	HBsAg negative, n (%)	p-value
Previous blood transfusion	Yes	3 (21.4)	11 (78.6)	0.027
	No	4 (3.4)	112 (96.6)	
Family history of hepatitis B	Yes	3 (25.0)	9 (75.0)	0.017
	No	4 (3.4)	114 (96.6)	
Known HBsAg-positive husband	Yes	2 (40.0)	3 (60.0)	0.023
	No or status unknown	5 (4.0)	120 (96.0)	
Previous dental procedure	Yes	4 (10.5)	34 (89.5)	0.193
	No	3 (3.3)	89 (96.7)	
Hepatitis B vaccination status	Unvaccinated	5 (8.9)	51 (91.1)	0.140
	At least one dose or status unknown	2 (2.7)	72 (97.3)	
History of jaundice	Yes	2 (25.0)	6 (75.0)	0.049
	No	5 (4.1)	117 (95.9)	
Elevated serum ALT	Present	2 (18.2)	9 (81.8)	0.106
	Absent	5 (4.2)	114 (95.8)	

DISCUSSION

This study demonstrated that the seropositivity of HBsAg was 5.4% in 130 pregnant women, which represents an intermediate level of HBV endemicity in this antenatal population. This is similar to a recent study by Ahmed et al., where the prevalence of HBsAg was 4.5% among pregnant women, indicating that hepatitis B is still present at a broadly similar low-to-intermediate level in the antenatal population of the country [12]. Higher prevalence rates have been reported in hospital-based antenatal cohorts in East Africa; for example, 8.1% and 6.6% were reported in hospital-based surveys in Northeast Ethiopia and Southern Ethiopia, respectively [13, 14]. These regional differences may be due to differences in background community prevalence, vaccination coverage, and high-risk exposure between the populations studied, and not just to differences in screening methodology. In this study, there was no statistically significant association between age and gravidity with HBsAg positivity. A similar absence of strong age association with seropositivity was seen in an antenatal population in Vientiane, Laos, where demographic factors alone failed to account for the observed differences in HBsAg carriage [15]. In the same way, urban-rural residence was not found to be a significant predictor in this study, as was also the case in a retrospective antenatal cohort by Eyong et al., where urban-rural residence was not identified as an independent predictor after other exposure-related variables were taken into account [16]. In contrast, several exposure-related variables were found to be statistically significant in our analysis and were associated with HBsAg positivity. Previous blood transfusion was significantly associated with seropositivity (21.4% vs 3.4%, p=0.027), similar to a Turkish antenatal study which found transfusion history among the exposure variables to be independently associated with HBsAg carriage in pregnant women [17]. A similar association was observed between family history of hepatitis B and seropositivity (25% vs 3.4%, p=0.017); similar results were found by Dortey et al., in which women with a family member affected had a significantly higher risk of HBsAg carriage [18]. In this study, a known HBsAg-positive husband was also strongly associated with maternal seropositivity (40% vs 4.0%, p=0.023). The status of the spouses has also been shown to be a significant correlate of maternal HBsAg carriage in the antenatal population in Egypt and Ghana, suggesting that intra-familial and sexual transmission may be important within infected households [19, 20]. Our study shows that the history of jaundice was also significantly associated with HBsAg positivity (25% vs 4.1%, p=0.049), consistent with Tanga et al., who found that self-reported jaundice was associated with confirmed HBsAg carriage, presumably reflecting previously unrecognized hepatic involvement [21]. The positivity rates for elevated serum ALT and previous dental procedures were higher in this study, but not statistically significant; similar non-significant trends for procedural and dental exposure have been reported by Kassaw et al., which may require larger sample sizes to achieve statistical significance for these variables [14]. Similarly, vaccination status was not significantly related to seropositivity in this study, as has been seen in other antenatal cohorts in similarly resource-poor settings where systematic coverage of hepatitis B vaccination is low [22]. All of these findings support the notion that antenatal screening for HBsAg should be focused on women with a history of blood transfusion, family history of hepatitis B, an HBsAg-positive partner, or previous jaundice, as these

factors have been consistently associated with an increased risk of infection in a variety of geographic and healthcare settings.

LIMITATIONS

The study was limited by its single-center design and small sample size, which may limit the generalizability of the results and reduce the power to detect associations for less common exposure variables.

CONCLUSION

The findings of this study demonstrated that the seropositivity of HBsAg was 5.4% among pregnant women attending a tertiary care hospital in Bangladesh, suggesting that hepatitis B is still a public health problem in this antenatal population. Previous blood transfusion, family history of hepatitis B, a known HBsAg-positive husband, and previous history of jaundice were strong and significant factors associated with seropositivity, which was not significantly affected by routine sociodemographic or obstetric characteristics. The results indicate a group of pregnant women with an unacceptably high risk of infection, and who may benefit most from targeted counselling and confirmatory testing. Given the low vaccination coverage observed in this cohort, a substantial gap in preventive protection is also evident. To minimize the burden of perinatal hepatitis B transmission in this context, systematic screening of HBsAg should be performed, and risk factors identified.

RECOMMENDATIONS

To better understand the risk of transmission, larger, multicenter studies including HBV DNA viral load and genotype analysis are suggested, which will help to inform targeted antenatal screening and vaccination strategies in Bangladesh.

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CONFLICT OF INTEREST

None declared

REFERENCES

1. Uz-Zaman MH, Rahman A, Yasmin M. Epidemiology of hepatitis B virus infection in Bangladesh: prevalence among general population, risk groups and genotype distribution. Genes. 2018 Nov 8;9(11):541.
2. Kebede KM, Abateneh DD, Belay AS. Hepatitis B virus infection among pregnant women in Ethiopia: a systematic review and Meta-analysis of prevalence studies. BMC infectious diseases. 2018 Jul 11;18(1):322.
3. Ikobah J, Okpara H, Elemi I, Ogarepe Y, Udoh E, Ekanem E. The prevalence of hepatitis B virus infection in Nigerian children prior to vaccine introduction into the National Programme on Immunization schedule. Pan African Medical Journal. 2016 Jul 11;23(1).
4. Araya Mezgebo T, Niguse S, Gebrekidan Kahsay A, Hailekiros H, Berhe N, Asmelash Dejene T. Hepatitis B virus infection and associated risk factors among pregnant women attending antenatal care in health facilities of Tigray, Northern Ethiopia. Journal of medical virology. 2018 Mar;90(3):503-9.
5. Gedefaw G, Waltengus F, Akililu A, Gelaye K. Risk factors associated with hepatitis B virus infection among pregnant women attending antenatal clinic at Felegehiwot referral hospital, Northwest Ethiopia, 2018: an institution based cross sectional study. BMC research notes. 2019 Aug 15;12(1):509.
6. Kishk R, Mandour M, Elprince M, Salem A, Nemr N, Eida M, Ragheb M. Pattern and interpretation of hepatitis B virus markers among pregnant women in North East Egypt. Brazilian Journal of Microbiology. 2020 Jun;51(2):593-600.
7. Dun-Dery F, Adokiya MN, Walana W, Yirkyio E, Ziem JB. Assessing the knowledge of expectant mothers on mother–to-child transmission of viral hepatitis B in Upper West region of Ghana. BMC Infectious Diseases. 2017 Jun 12;17(1):416.
8. Roble AK, Roba KT, Mengistie B, Abdurke Kure M. Seroprevalence of hepatitis B virus and associated factors among pregnant women attending antenatal care in public health facilities in Jigjiga Town, Eastern Ethiopia. International Journal of Women's Health. 2021 Jan 5:1299-310.
9. Yadav K, Verma P, Mishra PK, Yadav SK, Tripathi SK. Seroprevalence of Hepatitis B, Hepatitis C, Syphilis, Human Immunodeficiency Virus and Co-infections among Antenatal Women in a Tertiary care Hospital, Uttar Pradesh, India. Journal of Pure & Applied Microbiology. 2022 Mar 1;16(1).
10. Atalay AA, Abebe RK, Dadhi AE, Bededa WK. Seroprevalence of hepatitis B virus among pregnant women attending Antenatal care in Dilla University Referral Hospital Gedio Zone, Ethiopia; health facility based cross-sectional study. Plos one. 2021 Mar 25;16(3):e0249216.
11. Chernet A, Yesuf A, Alagaw A. Seroprevalence of Hepatitis B virus surface antigen and factors associated among pregnant women in Dawuro zone, SNNPR, Southwest Ethiopia: a cross sectional study. BMC research notes. 2017 Aug 22;10(1):418.
12. Ahmed A, Khan NA, Tofail FG, Hakim M, Siddique MA. Prevalence of HBsAg and Anti HCV Sero-Positivity among Healthy Bangladeshi Job Seekers in Gulf States and KSA. Bangladesh Medical Journal. 2010;39(2):35-9.
13. Gebretsadik D, Assefa M, Fenta GM, Daba C, Ali A, Tekele SG. High seroprevalence of hepatitis B and C virus infections among pregnant women attending antenatal clinic in Borumeda General Hospital, Northeast Ethiopia. BioMed Research International. 2022;2022(1):1395238.
14. Kassaw B, Abera N, Legesse T, Workineh A, Ambaw G. Sero-prevalence and associated factors of hepatitis B virus among pregnant women in Hawassa city public hospitals, Southern Ethiopia: Cross-sectional study design. SAGE Open Medicine. 2022 Dec;10:20503121221140778.
15. Bayo P, Ochola E, Oleo C, Mwaka AD. High prevalence of hepatitis B virus infection among pregnant women attending antenatal care: a cross-sectional study in two hospitals in northern Uganda. BMJ open. 2014 Nov 1;4(11):e005889.
16. Eyong EM, Yankam BM, Seraphine E, Ngwa CH, Nkfusai NC, Anye CS, Nfor GK, Cumber SN. The prevalence of HBsAg, knowledge and practice of hepatitis B prevention among pregnant women in the Limbe and Muyuka Health Districts of the South West region of Cameroon: a three-year retrospective study. Pan African Medical Journal. 2019 Mar 15;32(1).
17. Cetin S, Cetin M, Turhan E, Dolapcioglu K. Seroprevalence of hepatitis B surface antigen and associated risk factors among pregnant women. The Journal of Infection in Developing Countries. 2018 Oct 31;12(10):904-9.
18. Dortey BA, Anaba EA, Lassey AT, Damale NK, Maya ET. Seroprevalence of Hepatitis B virus infection and associated factors among pregnant women at Korle-Bu Teaching Hospital, Ghana. Plos one. 2020 Apr 22;15(4):e0232208.
19. Zahran KM, Badary MS, Agban MN, Abdel Aziz NH. Pattern of hepatitis virus infection among pregnant women and their newborns at the Women's Health Center of Assiut University, Upper Egypt. International Journal of Gynecology & Obstetrics. 2010 Nov;111(2):171-4.
20. Anabire NG, Aryee PA, Abdul-Karim A, Abdulai IB, Quaye O, Awandare GA, Helegbe GK. Prevalence of malaria and hepatitis B among pregnant women in Northern Ghana: comparing RDTs with PCR. PloS one. 2019 Feb 6;14(2):e0210365.
21. Tanga AT, Teshome MA, Hiko D, Fikru C, Jilo GK. Sero-prevalence of hepatitis B virus and associated factors among pregnant women in Gambella hospital, South Western Ethiopia: facility based cross-sectional study. BMC infectious diseases. 2019 Jul 10;19(1):602.
22. Yohanes T, Zerdo Z, Chufamo N. Seroprevalence and predictors of hepatitis B virus infection among pregnant women attending routine antenatal care in Arba Minch Hospital, South Ethiopia. Hepatitis research and treatment. 2016;2016(1):9290163.