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ORIGINAL ARTICLE

Prevalence and Risk Factors for Hepatitis B Virus Infection Among Pregnant Women Attending Antenatal Clinics in Northern Ethiopia

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SUMMARY

Background: **Hepatitis B virus (HBV) infection is one of the most common health problems worldwide and is associated with high mortality and heavy economic burdens. The aim of this study was to determine the prevalence of hepatitis B surface antigen (HBsAg) and associated risk factors among pregnant women attending antenatal clinics at Adigrat General Hospital in Northern Ethiopia.**

Methods: **An institutional-based cross-sectional study was conducted from January to March 2024 among 385 pregnant women. Participants were selected through a systematic random sampling method. Socio-demographic and associated factor data were collected using a structured questionnaire, and 5 mL blood samples were collected. The data were subsequently entered into EPI Info and analyzed using SPSS version 25. Descriptive statistics were computed. Bivariate and multivariate regression analyses were employed to measure associations, and values < 0.05 were considered to indicate statistical significance.**

Results: **The overall seroprevalence of HBsAg among the 385 study subjects enrolled was 10.4% (n = 40). HBsAg was common in all age groups. The prevalence of infection was greater in those who had a history of multiple sexual partners (22.7%), early piercing (13.4%), or abortion (27.6%), as was the history of delivery (26.3%) and genital mutilation (35.7%). According to multivariate logistic regression, patients were unmarried (AOR 8.57; 95% CI 3.20 - 22.93), illiterate (AOR 12.06; 95% CI 3.07 - 47.33), had a history of ear piercing (AOR 5.66; 95% CI 1.65 - 19.45), a history of abortion (AOR 8.16; 95% CI 3.18 - 20.95), a history of home delivery (AOR 6.69; 95% CI 1.26 - 35.53), and a history of genital mutilation (AOR 9.77; 95% CI 2.64 - 36.18) for acquiring HBV infection compared to their counterparts.**

Conclusions: **The results showed that HBV was highly prevalent in our study area. Being unmarried, having a low educational level, having an ear piercing, having an abortion, having a home delivery, and having genital mutilation were significantly associated with HBV infection. Therefore, these findings suggest that health education programs should be provided to the community to increase awareness among mothers.**

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KEYWORDS

hepatitis B virus, pregnant women, Adigrat General Hospital, Eastern Tigray, North Ethiopia

LIST OF ABBREVIATIONS

ADU - Adigrat University
ANC - Antenatal Clinic
CDC - Center for Disease Control and Prevention
CHB - chronic hepatitis B
CSA - Central Statistics Agency
DHS - demographic health survey
DNA - deoxyribonucleic acid
EFY - Ethiopian fiscal year
EIA - enzyme immunoassay
ELISA - enzyme-linked immunosorbent assay
FMOH - Federal Ministry of Health
HB - hepatitis B
HBeAg - hepatitis B e-antigen
HBIG - hepatitis B virus immunoglobulin
HBsAg - hepatitis B surface antigen
HBV - hepatitis B virus
HCC - hepatocellular carcinoma
HIV - human immunodeficiency virus
NND - neonatal deaths
RIA - radio immunoassay
RPM - revolutions per minute
SPSS - Statistical Package for the Social Sciences
USA - United States of America
VCT - Voluntary Counseling and Testing
WHO - World Health Organization

INTRODUCTION

Hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic diseases. The virus is most commonly transmitted from mother to child during birth and delivery, as well as through contact with blood or other body fluids [1].

Hepatitis B virus (HBV) infection is one of the most common health problem worldwide and is associated with high mortality and heavy economic burdens [2-4]. An estimated 2 billion people have been infected with the hepatitis B virus worldwide, and more than 257 million or 3.5% of the world's population are carriers of chronic HBV infection; the African and Western Pacific regions accounted for 68% of those infected. Assuming that women of reproductive age constitute 25.3% of the world's population (United Nations data), adults chronically infected may include 65 million women of childbearing age who can potentially transmit HBV to their babies [5]. More than 887,000 people die every year due to acute or chronic consequences of hepatitis B in the presence of hepatitis B surface antigen (HBsAg) [1, 6].

The prevalence of HBV infection is high in Africa, which has the second highest number of chronically infected individuals. Approximately 65 million HBV carriers live on the African continent; in particular, Sub-Saharan Africa is a region with more than 50 million chronic carriers of HBV, and more than 4.8 million of these individuals are children under five years old [7].

The management of hepatitis B virus (HBV) infection in pregnancy is complex. Because infection with HBV in infancy often leads to chronic disease, prevention of perinatal or vertical transmission is a major goal. Worldwide, vertical transmission remains the most frequent route of infection, particularly in endemic areas where up to 20% of women of childbearing age may have HBV. These women constitute a reservoir for perinatal transmission, which is associated with a very high rate of chronicity. Mother-to-child transmission is the predominant mode of HBV infection in high-intermediate endemic areas. Pregnant women are at risk of transmitting HBV to their offspring. Also, 95% of neonates infected with HBV at birth are at risk of developing chronic infection and 15% - 40% of them are at risk of developing cirrhosis and liver cancer. Prevention of mother-to-child transmission (PMTCT) of HBV is one of the five core strategies of global HBV elimination by 2030 [5,8,9].

The prevalence of HBV infections among the antenatal population may be a reliable indicator of the prevalence of hepatitis B virus in the general population. Hence, screening antenatal women for HBsAg can increase the detection of the disease in a population and provide an avenue for preventing maternal-to-child transmission of the virus [10].

Therefore, prevention of perinatal transmission remains an important target in the struggle for global eradication of HBV infection (the World Health Assembly adopted the Global Health Sector Strategy (GHSS) for viral hepatitis 2016 - 2021). Prevention is considered the best way to safeguard populations' health. Prevention can also lead to decreased spread of hepatitis virus, thus reducing the chances of disease transmission [11].

Hepatitis is becoming an emerging public health concern in Ethiopia. Several epidemiological studies of HBV among pregnant women are available in Eastern, Northwestern, and Southern Ethiopia. However, the results of these studies showed wide variation in prevalence, ranging from 2.3 to 7.8% [15-23] over time and across geographical areas. To our knowledge, there are no data about the magnitude of HBV infection among pregnant women in Eastern Tigray areas of Northern Ethiopia. Such data are fundamental for health planners and caregivers for evidence-based interventions. The aim of this study, therefore, was to determine the prevalence of hepatitis B surface antigen (HBsAg) and associated risk factors among pregnant women attending antenatal clinics in Tigray, Adigrat General Hospital, Northern Ethiopia.

MATERIALS AND METHODS

Study setting

The study was conducted at the Adigrat General Hospital, Eastern Tigray, Northern Ethiopia, located 876 km away from Addis Abeba and 104 km from Mekelle, the capital city of Tigray. This hospital is located at altitudes ranging from 2,000 - 3,000 meters above sea level and is geographically located at 14° 16' N latitude and 39° 27' E longitude. The annual rainfall ranges from 400 - 600 mm. According to the 2007 national census conducted by the Central Statistical Agency of Ethiopia, this town has a total population of 57,588 people, 26,010 of whom are men and 31,578 of whom are women [12].

The Adigrat General Hospital is a general hospital in the eastern zone of Tigray and provides services to approximately 1 million people who live in the Adigrat and surrounding areas, from outpatient services to major operations. This hospital also provides approximately 250 - 300 antenatal care (ANC) services monthly.

Study design, period, and sample size

An institutional cross-sectional study was conducted from January 15 through March 15, 2024. All pregnant women attending ANC at Adigrat General Hospital were eligible for the study. The sample size was determined using a single population proportion formula considering a 50% proportion of seropositive individuals, 5% margin of error, and 95% confidence interval (CI); the final sample size was 385. The systematic random sampling method was applied to select the study participants among the ANC attendants. On average, 12 pregnant women visited the hospital each day. Considering the four-month study period, 1,000 - 1,200 pregnant women were expected to visit the ANC during the study period. Hence, the sampling interval was found to be every third; out of the first three participants, one was randomly selected by the lottery method, and then, every 3rd woman was selected to participate in the study.

Data collection

Socio-demographic and associated risk factor data for HBV were collected using a structured questionnaire filled in by 2 professional midwives after receiving a clear explanation on the objective of the study and informed consent from the participants was provided via a standard consent form. The supervisors were assigned appropriate support during the data collection processes.

Specimen collection, processing, and testing

After providing informed consent, 5 mL of venous blood were collected from the peripheral vein in plain test tubes under aseptic conditions by experienced laboratory personnel from all the pregnant women who provided consent. These tubes were labeled with a unique identification number and centrifuged at 3,000 revolutions per minute (RPM) for at least 10 minutes at room temperature, after which the samples were processed by using a rapid diagnostic test for HBV at the Adigrat General Hospital. To maintain the quality of the laboratory results, standard operating procedures (SOPs) were performed strictly according to the instructions of the test kit.

Principle of the rapid diagnostic test

The one-step cassette-style HBsAg test is a chromatographic immunoassay for in vitro diagnosis combined with conjugated colloidal gold technology for the qualitative detection of hepatitis B surface antibody (HBsAg) in human serum specimens. Two monoclonal antibodies were used to identify HBsAg specifically.

Accuracy of the Bioline HBsAg strip

Bioline HBsAg was compared with a leading commercial radio immunoassay (RIA) and an enzyme immunoassay (EIA) test for hepatitis B. There was 98% overall agreement between RIA and Bioline HBsAg and 97% between EIA and Bioline HBsAg. Bioline HBsAg will detect any level of HBsAg in serum higher than 5 ng/mL within 10 minutes. However, to detect concentrations below 5 ng/mL and to confirm negative results, the test should be read at the end of 15 to 20 minutes. All ten HBsAg subtypes (ayw1, ayw2, ayw3, ayw4, aayr, adw2, adw4, adrg +adr and adr) produce a positive result in HBsAg assay [40].

Method of data analysis

The data were checked for completeness and consistency, entered into Epi-Data version 3.1, and exported to SPSS version 25 for analysis. Descriptive statistical tests, such as frequency and median, were used to compute the socio-demographic, behavioral, and dependent variables. Tables and graphs were used for data presentation. Bivariate logistic regression analysis was conducted primarily to evaluate the association between each independent variable and the dependent variable at a p-value < 0.2 and a multivariate logistic regression model were used to analyze the specific associations between variables. The odds ratio (OR) and 95% confidence interval (CI) were calculated by using a logistic regression model to measure the strength of the associations. A p-value < 0.05 was considered to indicate statistical significance.

Ethical considerations

This study obtained ethical clearance from the Institutional Health Research and Community Service of Medicine and Health Science College of Adigrat University and Tigray Health Research Institute/IRB No. 4031/039/16 E.C. All study participants were informed about the study and were assured about the confidentiality, protection, and anonymity of the data. Written informed consent was obtained from each study participant prior to data collection, and they participated voluntarily in the study. All HBsAg-positive mothers were referred to a physician for further management.

Table 1. Socio-demographic characteristics and seroprevalence of HBV infection status among pregnant women attending the Antenatal Care Unit at Adigrat General Hospital, 2024 (n = 385).

Variable	Category	Frequency (%)	HBV status	
			Positive (%)	Negative (%)
Age				
	18 - 28	**242 (62.9)**	**25 (10.3)**	**217 (89.7)**
	29 - 39	**132 (34.2)**	**14 (10.6)**	**118 (89.4)**
	≥ 40	**11 (2.9)**	**1 (9.1)**	**10 (90.9)**
Residence				
	Urban	**333 (86.5)**	**35 (10.5)**	**298 (89.5)**
	Rural	**52 (13.5)**	**5 (9.6)**	**47 (90.4)**
Marital status				
	Married	**323 (83.9)**	**19 (5.9)**	**304 (94.1)**
	Unmarried [a]	**62 (12.1)**	**21 (33.9)**	**41 (66.1)**
Educational level				
	Illiterate	**60 (15.6)**	**12 (20.0)**	**48 (60.0)**
	1 - 8	**144 (37.4)**	**22 (15.3)**	**122 (84.7)**
	Higher education [+]	**181 (47.0)**	**6 (3.3)**	**175 (96.7)**
Occupation				
	Housewife	**261 (67.8)**	**26 (10.0)**	**235 (90.0)**
	Merchant	**82 (21.3)**	**10 (12.2)**	**72 (87.8)**
	Civil servant	**34 (8.8)**	**2 (5.9)**	**32 (94.1)**
	Farmer	**8 (2.1)**	**2 (25.0)**	**6 (75.0)**
Religion				
	Orthodox	**216 (56.1)**	**21 (9.7)**	**195 (90.3)**
	Muslim	**76 (19.7)**	**10 (13.2)**	**66 (86.8)**
	Catholic	**80 (20.8)**	**8 (10.0)**	**72 (90.0)**
	Other	**13 (3.4)**	**1 (7.7)**	**12 (92.3)**
Gravidity				
	Primigravida	**75 (19.5)**	**9 (12.0)**	**66 (88.0)**
	Multigravida	**310 (80.5)**	**31 (10.0)**	**279 (90.0)**

RESULTS

Socio-demographic characteristics of the study participants

A total of 385 pregnant women participated in this study. The age of the study participants ranged between 18 and 45 years, with a median age of 25 years (IQR 23 - 25). The majority of the study subjects (62.9%) were aged 18 - 28 years. More than half of the study participants, 333 (86.5%), were living in urban areas. Three hundred twenty-three (83.9%) of them were married, and 261 (67.8%) were housewives. One hundred eighty-one (47.0%) of the participants had completed higher education. According to the gravidity and parity status, approximately 80.5% of the participants were pregnant more than once (multigravida), and 19.5% had one or more previous deliveries. Hepatitis B virus (HBV) infection was common across the age groups of the participants. The highest prevalence of HBV was observed in unmarried women (33.9%) and in illiterate women (20.0%) (Table 1).

Culture- and behavior-related risk factors for HBV infection

Among the 385 participants, 40 (10.4%) were HBsAg-positive for HBV infection. Our study showed that the prevalence of HBV infection was greater among pregnant mothers with a history of multiple sexual partners (15; 22.7%), ear piercing (34; 13.4%), history of abortion (27.6%), history of delivery (5; 26.3%), history of genital mutilation (10; 35.7%), history of tattooing (6; 17.1%), dental extraction (1; 27.8%), history of splash-

Table 2. Distribution of cultural- and behavioral-related risk factors of HBV infection among pregnant women attending the Antenatal Care Clinic at Adigrat General Hospital, Northern Ethiopia, 2024 (n = 385).

Characteristics	Frequency (%)	HBV status	
		Positive (%)	Negative (%)
Use of sharp materials			
Yes	72 (18.7)	4 (5.6)	68 (94.4)
No	313 (81.3)	36 (11.5)	277 (88.5)
Multiple sexual partners			
Yes	66 (17.1)	15 (22.7)	51 (77.3)
No	319 (82.9)	25 (7.8)	294 (92.2)
Ear piercing			
Yes	253 (65.7)	34 (13.4)	219 (86.6)
No	132 (34.3)	6 (4.6)	126 (95.4)
History of abortion			
Yes	98 (25.5)	27 (27.6)	71 (72.4)
No	287 (74.5)	13 (4.5)	274 (95.5)
History of delivery			
Home	19 (4.9)	5 (26.3)	14 (73.7)
Health facility	366 (95.1)	35 (9.6)	331 (90.4)
History of genital mutilation			
Yes	28 (7.3)	10 (35.7)	18 (64.3)
No	357 (92.7)	30 (8.4)	327 (91.6)
History of hospital admission			
Yes	44 (11.4)	3 (7.3)	41 (92.7)
No	341 (88.6)	37 (10.6)	304 (89.4)
History of surgical procedure			
Yes	20 (5.2)	1 (5.0)	19 (95.0)
No	365 (94.8)	39 (10.7)	326 (89.3)
History of blood donation			
Yes	40 (10.4)	3 (7.5)	37 (92.5)
No	345 (89.6)	37 (10.7)	308 (89.3)
Tattoo			
Yes	35 (9.1)	6 (17.1)	29 (82.9)
No	350 (90.9)	34 (9.7)	316 (90.3)
Dental extraction			
Yes	36 (9.4)	10 (27.8)	26 (72.2)
No	349 (90.6)	30 (8.6)	319 (91.4)
History of splash body fluid			
Yes	28 (7.3)	9 (32.1)	19 (67.9)
No	357 (92.7)	31 (8.7)	326 (91.3)
History of unsafe injection of drugs			
Yes	32 (8.3)	8 (25)	24 (75)
No	353 (91.7)	32 (9.1)	321(90.9)
Sharing of sharp materials			
Yes	41 (10.6)	10 (24.4)	31(75.6)
No	344 (89.4)	30 (8.7)	314 (91.3)
Sharing of toothbrushes			
Yes	12 (3.1)	3 (25.0)	9 (75.0)
No	373 (96.9)	37 (9.9)	336 (90.1)

Table 3. Multivariate analysis of variables of HBV (HBsAg) infection among pregnant women attending the Antenatal Care Unit at Adigrat General Hospital, 2024 (n = 385).

Variables	HBV status		COR (95% CI)	AOR (95% CI)	p-value
	Positive n (%)	Negative n (%)			
Age				*	
18 - 28	**25 (10.3)**	**217 (89.7)**	**1**		
29 - 39	**14 (10.6)**	**118 (89.4)**	**1.03 (0.52 - 2.06)**		
> 40	**1 (9.1)**	**10 (90.9)**	**0.87 (0.11 - 7.07)**		
Residence					
Urban	**35 (10.5)**	**298 (89.5)**	**1.10 (0.41 - 2.96)**	*	
Rural	**5 (9.6)**	**47 (90.4)**	**1**		
Marital status					
Married	**19 (5.9)**	**304 (94.1)**	**1**	**1**	
Unmarried [a]	**21 (33.9)**	**41 (66.1)**	**8.19 (4.07 - 16.52)**	**8.57 (3.20 - 22.93)**	**0.000 [b]**
Educational Level					
Illiterate	**12 (20.0)**	**48 (80.0)**	**7.29 (2.60 - 20.44)**	**12.06 (3.07 - 47.33)**	**0.000 [b]**
1 - 8	**22 (15.3)**	**122 (84.7)**	**5.26 (2.07 - 13.36)**	**6.72 (2.09 - 21.65)**	**0.001 [b]**
Higher education	**6 (3.3)**	**175 (96.7)**	**1**	**1**	
Occupation				*	
Housewife	**26 (10.0)**	**235 (90.0)**	**0.33 (0.06 - 1.73)**		
Merchant	**10 (12.2)**	**72 (87.8)**	**0.42 (0.07 - 2.35)**		
Civil servant	**2 (5.9)**	**32 (94.1)**	**0.19 (0.02 - 1.60)**		
Farmer	**2 (25.0)**	**6 (75.0)**	**1**		
Religion				*	
Orthodox	**21 (9.7)**	**195 (90.3)**	**1.29 (0.16 - 10.44)**		
Muslim	**10 (13.2)**	**66 (86.8)**	**1.82 (0.21 - 15.54)**		
Catholic	**8 (10.0)**	**72 (90.0)**	**1.33 (0.15 - 11.64)**		
Other	**1 (7.7)**	**12 (92.3)**	**1**		
Gravidity				*	
Primigravida	**9 (12.0)**	**66 (88.0)**	**1**		
Multigravida	**31 (10.0)**	**279 (90.0)**	**0.82 (0.37 - 1.79)**		
Use of sharp materials				*	
Yes	**4 (5.6)**	**68 (94.4)**	**0.45 (0.16 - 1.32)**		
No	**36 (11.5)**	**277 (88.5)**	**1**		
Multiple sexual partners					
Yes	**15 (22.7)**	**51 (77.3)**	**3.46 (1.71 - 7.01)**	**2.61 (0.95 - 7.12)**	**0.062**
No	**25 (7.8)**	**294 (92.2)**	**1**	**1**	
Ear piercing					
Yes	**34 (13.4)**	**219 (86.6)**	**3.26 (1.33 - 7.98)**	**5.66 (1.65 - 19.45)**	**0.006 [b]**
No	**6 (4.6)**	**126 (95.4)**	**1**	**1**	
History of abortion					
Yes	**27 (27.6)**	**71 (72.4)**	**8.02 (3.94 - 16.32)**	**8.16 (3.18 - 20.95)**	**0.000 [b]**
No	**13 (4.5)**	**274 (95.5)**	**1**	**1**	
History of delivery					
Home	**5 (26.3)**	**14 (73.7)**	**3.38 (1.15 - 9.94)**	**6.69 (1.26 - 35.53)**	**0.026 [b]**
Health facility	**35 (9.6)**	**331 (90.4)**	**1**		

Table 3. Multivariate analysis of variables of HBV (HBsAg) infection among pregnant women attending the Antenatal Care Unit at Adigrat General Hospital, 2024 (n = 385) (continued).

Variables	HBV status		COR (95% CI)	AOR (95% CI)	p-value
	Positive n (%)	Negative n (%)			
History of genital mutilation					
Yes	10 (35.7)	18 (64.3)	6.06 (2.57 - 14.29)	9.77 (2.64 - 36.18)	0.001 [b]
No	30 (8.4)	327 (91.6)			
History of hospital admission				*	
Yes	3 (7.3)	41 (92.7)	0.60 (0.18 - 2.04)		
No	37 (10.6)	304 (89.4)	1		
History of surgical procedure				*	
Yes	1 (5.0)	19 (95.0)	0.44 (0.06 - 3.38)		
No	39 (10.7)	326 (89.3)	1		
History of blood donation				*	
Yes	3 (7.5)	37 (92.5)	0.68 (0.20 - 2.30)		
No	37 (10.7)	308 (89.3)	1		
Tattoo				*	
Yes	6 (17.1)	29 (82.9)	1.92 (0.75 - 4.96)		
No	34 (9.7)	316 (90.3)	1		
Dental extraction					
Yes	10 (27.8)	26 (72.2)	4.09 (1.80 - 9.28)	2.64 (0.31 - 22.59)	0.376
No	30 (8.6)	319 (91.4)	1	1	
History of splash body fluid					
Yes	9 (32.1)	19 (67.9)	4.98 (2.08 - 11.94)	4.62(0.57 - 37.55)	0.152
No	31 (8.7)	326 (91.3)	1	1	
History of unsafe injection of drugs					
Yes	8 (25)	24 (75)	3.34 (1.39 - 8.05)	2.23 (0.47 - 10.55)	0.312
No	32 (9.1)	321(90.9)	1	1	
Sharing of sharp materials					
Yes	10 (24.4)	31 (75.6)	3.38 (1.51 - 7.55)	1.61 (0.46 - 5.60)	0.452
No	30 (8.7)	314 (91.3)	1	1	
Sharing of toothbrushes				*	
Yes	3 (25.0)	9 (75.0)	3.03 (0.79 - 11.68)		
No	37 (9.9)	336 (90.1)	1		

*** p-value > 0.20 in bivariate analysis, [b] p < 0.05 significate associated, [1] reference category, [a] combination of unmarried, divorced, and widowed. COR - crude odd ratio, AOR - adjusted odd ratio.**

ing of body fluid (9; 32.1%), unsafe drug injection (8; 25.0%), history of sharing sharp materials (10; 24.4%), and previous history of sharing tooth brush (3; 25%) (Table 2).

Factors associated with hepatitis B virus infection

Bivariate logistic regression analysis revealed that level of education, marital status, history of having multiple sexual partners, history of ear piercing, history of abortion, history of site of delivery, history of genital mutilation, history of dental extraction, history of splashing of body fluid, history of unsafe injection of drugs, and history of sharing sharp materials were significantly associated with HBV infection. On the other hand, there were no statistically significant associations between age, residence, occupational status, history of surgical procedures, tattooing, history of blood transfusion, history of hospital admission, or parity status with HBV

infection among pregnant women. However, according to multivariate logistic regression, some risk factors were found to be significant predictors of HBV infection. Those are marital status, education level, history of ear piercing, history of abortion, history of site of delivery, and history of genital mutilation, and they were significantly associated with HBV infection. Pregnant women who were unmarried had a greater risk of acquiring HBV infection (AOR 8.57; 95% CI 3.20 - 22.93; $p < 0.000$) than pregnant women who were married. Among the pregnant women, 12 were illiterate (AOR 12.06; 95% CI 3.07 - 47.33; $p < 0.000$) and were more likely to be infected with HBV than pregnant women who had a higher education level. In addition, there were statistically significant positive associations with HBV infection among pregnant mothers who had a history of ear piercing (AOR 5.66; 95% CI 1.65 - 19.45, $p < 0.006$), history of abortion (AOR 8.16; 95% CI 3.18 - 20.95, $p < 0.00$), history of home delivery (AOR 6.69; 95% CI 1.26 - 35.53, $p < 0.026$), and history of genital mutilation (AOR 9.77; 95% CI 2.64 - 36.18, $p < 0.001$) for acquiring HBV infection compared to their counterparts (Table 3).

DISCUSSION

In this study, we found that the prevalence of hepatitis B virus surface antigen among pregnant women was 10.4%. The overall incidence of HBsAg in this study was categorized as high (> 8%) according to the WHO classification [5,11]. These findings are in line with those of studies conducted in Yemen (10.8%) [13], Burkina Faso (9.8%) [14], Tanzania (8.03%) [15], and Ghana (10.6%) [16]. However, these findings are higher than those reported from Mekelle (5.5%) [17], different parts of the Amhara region (4.4% - 5.3%) [18-20], two studies in Addis Ababa (3% - 7%) [21,38], studies in southern Ethiopia (3.5% - 7.8%) [22-24], in South Africa (4.5%) [25], and in India (1.3%) [26]. Yet, these findings are lower than those of earlier surveys of Ethiopian blood donors (14.4%) [27], Ghana (16.7%) [28], and Nigeria (17.2%) [29]. This variation might be due to differences in geographic region, genetics, culture and behavioral practices, sampling methods, or test methods used to detect HBV infection.

In the present study, the prevalence of HBsAg was almost equally distributed among all the age groups. This finding is consistent with a report in Addis Ababa [21], Felegehiwot Referral Hospital [19], and Gambella [30]. However, our findings did not agree with studies conducted at Deder Hospital [31], Bishoftu General Hospital [32], and Burkina Faso [14]. A possible explanation for this difference could be the sample size, sampling method, and categorization of age.

In our study, the prevalence of HBsAg was greater for single partners than for married women. Our findings were supported by studies conducted at Deder Hospital [31], Felege Hiwot Referral Hospital [19], Wollega [33], and Dawuro Zone [22] and however, this finding contradicts the findings of studies conducted in selected health facilities in Addis Ababa [21], Mekelle [17] and southeastern zone [34], and Yirgalem Hospital [23]. These differences could be due to variations in the sample size of the participants, sampling methods, and cultural characteristics.

Although the difference was not statistically significant, in the present study, the prevalence of HBsAg was greater in those who had multiple sexual partners and a history of dental extraction. These findings are in agreement with previous studies conducted in Mekelle and Southeastern Tigray (17) and in different world epidemiology [35].

In this study, marital status, educational status, history of ear piercing, history of abortion, history of home delivery, and history of genital mutilation were significantly associated with HBV infection. Our results were supported by studies conducted at Deder Hospital [31], Paulo's Hospital [31], and Shashemene General Hospital [36]. However, other reports from Yemen [13], Mauritania [37], and Nigeria [10] contradicted our findings. The differences could be attributed to variations in sample size, sampling method, access to health facilities, and poor practices related to infection prevention strategies. Interestingly, we found that factors such as age, residence, occupation, multiple sexual partners, tattooing, blood transfusion status, and history of tooth extraction were not significantly associated with HBV infection, which is consistent with the findings reported in Cameroon [39] and different parts of Nigeria [7,10,29], but inconsistent with the findings of other studies [17,19,31,37]. These differences could be due to variations in sample size, economic status, and safety precautions.

In this study, the overall prevalence of HBV among pregnant women was 10.4%. This prevalence of HBsAg was categorized as high (> 8%) according to the WHO classification. Being unmarried, having a low educational level, having a history of ear piercing, having a history of abortion, having a history of home delivery, and having a history of genital mutilation were significantly associated with HBV infection. Therefore, these findings suggest that the vertical transmission of HBV may be a serious public health problem in the study area. Thus, to decrease the prevalence of this viral infection, we recommend that health education programs on the mode of HBV transmission, high-risk behaviors, and methods of prevention be provided to communities to increase the awareness of mothers. Furthermore, all pregnant women should be screened, and their children should be vaccinated at birth with the single-dose hepatitis B vaccine to overcome the cycle of mother-to-child transmission.

Limitations of the study

This was a single-point study. Moreover, screening for other serological markers, such as anti-HBs and anti-HBc antibodies, would not be useful for determining the

overall prevalence of HBV infection. Additionally, we could not confirm a positive result using an enzyme-linked immunoassay (ELISA) nor determine the extent of perinatal transmission of HBV by checking for HBeAg due to the lack of reagent kits and resource constraints.

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Availability of Data and Material:
The findings of this study were generated from the data collected and were analyzed based on the stated methods and materials. All the data are already found in the manuscript, and there are no supplementary files. The original data supporting these findings will be available at any time upon request.

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Ethical Approval and Consent to Participate:
This study was reviewed and approved by the Institutional Ethics Review Committee of Adigrat University, College of Medicine and Health Sciences, and after discussion of the purpose and aim of the study, permission was obtained from the Adigrat General Hospital chief executive officer. Written informed consent was not obtained from the study participants as primary data were used. The confidentiality and anonymity of the results was also maintained, and the results were not communicated for other purposes.

Declaration of Interest:
The authors declare that they have no competing interests.

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