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RESEARCH ARTICLE

Sero-Prevalence, Infectivity, and Associated Risk Factors of Hepatitis B Virus Among Pregnant Women Attending Antenatal Care in Sankura Primary Hospital, Silte Zone, Southern Ethiopia, 2021

Bedru Argaw[1], Shemsu Kedir[2,*], Abdulmejid Mustefa[2], Mubarek Yesse[2], Leila Hussen[2], Behradin Abdella[3], Mohammed Muze[3] and Musa Jemal[2]

[1]*Department of Medical Laboratory Sciences, College of Medicine and Health Sciences, Werabe University, Werabe, Ethiopia*
[2]*Department of Public Health, College of Medicine and Health Sciences, Werabe University, Werabe, Ethiopia*
[3]*Department of Nursing, College of Medicine and Health Sciences, Werabe University, Werabe, Ethiopia*

Abstract:

Background:

Hepatitis B (HBV) infection causes a major public health problem around the globe. Therefore, this study aimed to assess the Seroprevalence, infectivity, and associated factors of hepatitis B virus infection among pregnant women attending antenatal care in Sankura Primary Hospital, Southern Ethiopia.

Methods:

A cross-sectional study design was conducted in Sankura Primary Hospital, Southern Ethiopia, from April to June 2020. A total of 338 pregnant women were recruited using systematic random sampling. Sociodemographic and associated risk factors were collected through a structured questionnaire. Blood samples and plasma analysis were performed for the presence of hepatitis B surface antigen (HBsAg) and hepatitis B envelope antigen (HBeAg) using the rapid test strip method. Statistical analysis was done using SPSS version 20, and P-value < 0.05 was considered statistically significant.

Results:

The overall Seroprevalence of HBsAg was 11 (3.3%) [95% CI 1.5% - 5.0%], of whom 2 (18.2%) were positive for HBeAg. In multivariate analysis, a history of blood transfusion [AOR=4.8 95% CI (1.25-6.69)] and contact with a family history of the liver [AOR=5.7 95% CI (1.28-7.9)] was found to be significant predictors of HBV infections.

Conclusion:

The Seroprevalence of HBV infection among pregnant women in the study area was intermediate. Family history of liver disease and blood transfusion were risk factors associated with HBV infection. Hence, improving the screening of blood, increasing awareness about the transmission of HBV infection, and screening pregnant women for HBV infection should be implemented. The government will build efficient service delivery models equipped with an appropriate and well-trained workforce.

Keywords: HBV, Seroprevalence, HBsAg, HBeAg, Infectivity, Pregnancy.

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1. INTRODUCTION

Hepatitis B-Virus (HBV) is a 40-42-nm enveloped virus classified in the Hepadnaviridae family, which infects the liver [1]. HBV contains a circular, partially double-stranded DNA genome that is 3.2 kb in length [2]. It is primarily infects hepatocytes and may lead to chronic hepatitis, liver cirrhosis, hepatocellular carcinoma (HCC), and other severe liver diseases [3, 4]. HBV is commonly transmitted from an infected person to others through direct contact with infected blood, unprotected sexual intercourse, from an infected woman to her newborn during pregnancy and childbirth, use of Needles and other medical/dental equipment or procedures that are

* Address correspondence to this author at the Department of Public Health, College of Medicine and Health Sciences, Werabe University, Werabe, Ethiopia; Tel: +251932603556; E-mail: mahirshemsu56@gmail.com

contaminated or not sterile [5, 6]. The other potential routes of this infection are body piercing, tattooing, acupuncture, and even nail salons unless sterile needles and equipment are used [7].

Most vertical transmission of hepatitis B virus from mother to child are at the time of labor. Infants born to mothers who are positive for both HBsAg and hepatitis B e antigen (HBeAg) are at a higher risk of acquiring infection (transmission risk for HBsAg positive and HBeAg-positive mothers: 70-100% in Asia and 40% in Africa) than those born to HBsAg-positive mothers who have lost the HBeAg (5-30% in Asia and 5% in Africa) [8 - 10].

Diagnosis of HBV is made by detecting its sero markers and biomarkers, which include HBsAg, antibody to hepatitis B surface antigen (anti-HBs), HBeAg, and antibody to hepatitis B core antigen (anti-HBc), and nucleic acid-based tests, and histological techniques [7]. Acute HBV infection is characterized by the presence of HBsAg and immunoglobulin M (IgM) antibodies to the core antigen, HBcAg. During the initial phase of infection, patients are also seropositive for hepatitis B envelop antigen (HBeAg) [6]. HBeAg is usually a marker of high ranges of replication of the virus. The presence of HBeAg indicates that the blood and body fluids of the infected person are enormously infectious [11]. Tenofovir, or entecavir- is the most potent oral drug recommended by WHO and used to suppress the hepatitis B virus. Their resistance rate is low compared to other drugs that are easy to take (1 pill per day) and have few side effects. Therefore, only limited monitoring is required [12].

HBV transmission can be prevented through screening of all pregnant women for HBsAg and providing antiretroviral therapy, HepB vaccination for infants, giving HBV vaccine with HBIG for children born from infected mothers, screening blood before donation, routine vaccination of previously unvaccinated children aged <19 years, vaccination of adults at risk for HBV infection, including those requesting protection from HBV without acknowledgment of a specific risk factor and education programs directed towards disease awareness [13].

Globally, in 2015, an estimated 257 million people lived with chronic HBV infection, and 4.5 million new cases of HBV were reported per year. In 2015, 1.34 million deaths occured due to the hepatitis B virus. Moreover, 720,000 and 470,000 individuals died due to cirrhosis hepatocellular carcinoma [14].

The magnitude of chronic HBV infection varies widely according to the geographical area and principal routes of transmission. The global prevalence of chronic HBV infection varies widely, Africa and Asia from high (≥8%,), Southern and Eastern Europe to intermediate (2-7%)) and Western Europe, North America, and Australia low (<2%,), and a medium to high endemicity of HBV was reported in Ethiopia [15].

The main route of transmission of HBV infection in many parts of the globe is perinatal. The threat risk of vertical transmission depends on the time at which a pregnant woman acquires HBV infection. In the absence of immuno-prophylaxis, 10-20% of women seropositive for HBsAg transmit the virus to their neonates [16]. Perinatal infection which counts for up to 90% of developing the risk of chronic infection. Whereas between the age of 6 months to 5 years, the risk of chronic infection decreases to 20-60% [17].

The main complication of viral hepatitis during pregnancy is spontaneous abortion, IUGR, premature delivery and low birth weight of infants [18, 19].

Different studies conducted in Ethiopia shows that the occurrence of HBV infection in pregnant women ranged from 3.0% to 8.1% [10, 20 - 22]. These indicate that pregnant women in different geographical areas have a different prevalence of HBV infection. Very little was recognized about the prevalence, infectivity, and associated factors of Hepatitis B virus infection among pregnant women in the study area. Therefore, this study aimed to determine the Seroprevalence, infectivity, and related factors of HBV infection among pregnant women attending antenatal clinics at Sankura Primary Hospital, Southern Ethiopia.

2. MATERIALS AND METHODS

2.1. Study Area and Period

This study was performed at the Sankura Primary Hospital. The hospital is situated in Sankura woreda, Silti zone, Southern Ethiopia. The Woreda has an estimated total population of 251,761 people; of whom, 124,870 (49.6%) are women, and 20,874 (8.29%) are urban dwellers. The hospital provides services for around 250,112 population in the catchment area, with 55,334 males and 55,778 females. Moreover, the hospital provides prevention of Mother-child transmission (PMTCT) service to pregnant women attending antenatal care free of charge. In addition, services given to the women include Laboratory testing for sexually transmitting infection (STI), Anemia, and Blood group. Moreover, additional services like Tetanus toxoid (TT) immunization and treatment are given. On average, 15 pregnant women each day attend the antenatal care clinic of the hospital. The study was conducted from April to June 2020.

2.2. Study Design

An institution-based crossectionl study design was employed.

2.3. Population

2.3.1. Source Population

A pregnant woman who was living at least six months in Sankura town.

2.3.2. Study Population

All pregnant women whowere randomly selected from those have attended the ANC clinic of Sankura Primary Hospital during the study period.

2.4. Eligibility

2.4.1. Inclusion Criteria

All pregnant women who have been given consent to take part and are naive to antiretroviral remedy, must be included.

2.4.2. Exclusion Criteria

A pregnant woman had a mental health problem and was unable to be interviewed.

2.5. Sample Size Calculation and Sampling Technique

The sample size were determined using the single population proportion formula, assuming the seroprevalence of HBV among pregnant women (7.8%) [23], and a 95% level of confidence. A precision of 3.0% is considered the suggestion that one-half of the estimated prevalence would be appropriate in cases when seroprevalence is lower than 10% or higher than 90%, and the final sample size was 338 by considering the 10% non-response rate [24].

A systematic random sampling method was utilized to recruit pregnant women attending the ANC clinics. Considering a three-month study period, an estimated 900 pregnant women visited the ANC according to the hospital plan and the past three-month performance document review. The estimated sample size was divided into total pregnant women who were attended during three months of the data collection period to determine the sample interval (k value), which was 3. The 1st served pregnant woman, and then every 3rd woman thereafter, was invited to participate in the study until the required sample size was obtained.

2.6. Data Collection Method

2.6.1. Interview

A pretested and structured questionnaire was utilized to collect information on socio-demography, risky sexual behavior, history of hospital admission, history of abortion, and contact with HBV-infected individuals. One nurse working in OPD other than in ANC clinics of the hospital was assigned to collect data from the participant using an interview, and one health officer as the supervisor selected from the hospital.

2.6.2. Laboratory Testing

After the completion of the questionnaire, 5ml of venous blood was once aseptically accumulated with the aid of venipuncture into an Ethylene Di-amine Tetra acetic Acid (EDTA) tube. The plasma obtained from every sample was examined for the presence of HBsAg using a commercial strip, according to the manufacturer's instructions. Eugene rapid test is a qualitative, solid phase, two-site sandwich immunoassay for the detection of HBs Ag in serum HBV infection status - was defined by a positive or negative result for HBsAg using HBsAg test strip. All HBsAg-positive women were tested for the presence of HBeAg using a one-step rapid strip test. The sensitivity and specificity of the check package were >99 percent, as claimed through the manufacturer.

2.7. Data Quality Assurance

The questionnaire was first prepared in English and translated to Amharic and then translated back to the English version to keep their consistency. One week before records collection, the questionnaire used to be pretested to 5% of the required sample size at Werabe Town Health Center other than the actual study site to ensure the question were unambiguous. Before the establishing of any information collection, all data collectors were trained by the principal investigator with an overview of the assessment and its objectives. The collected data had been checked on daily basis for consistency and accuracy. Standardized procedures were strictly followed at the time of blood sample collection, storage, and analytical process. The quality of test results should be maintained using the internal quality control of the test kits.

2.8. Data Analysis

Data were coded and entered using EpiData 3.1, and further analysis was done using IBM SPSS for Windows, version 21.0. Results were summarized using descriptive statistics like mean and standard deviation, including a table. Multivariate logistic regression analysis was performed to identify the associated independent factors followed by the candidate variables found by bivariate logistic regression analysis. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to measure the strength of associations, and p-values less than 0.05 were considered statistically significant.

2.9. Ethical Consideration

The study was approved by the Institutional Review Board (IRB) of the Werabe University Research Directorate. A support letter was also obtained from Sankura Woreda Health Office. Participation in the study was fully voluntary. After written consent was taken, participants were assured that information obtained during the study would be kept confidential. All laboratory testing was conducted free of charge, and individuals positive for HBsAg were managed by physicians. Moreover, on-site awareness was given to women who take care and do not transmit the virus to their children and family members.

3. RESULTS

3.1. Socio-demographic Characteristics

A total of 338 study participants were enrolled in this study. The mean age was 27.5 years (standard deviation (SD), 5.5; range, 17-40 years), and a substantial number (33.4%) were in the age category 26-30 years. The majority of the study participants were rural residence (74%) and 59.8% had no formal education. Concerning marital status, (93.5%) were married and lived together. More than half of the study participants were housewives in occupation (Table **1**).

3.2. Prevalence of HBV Infection

The overall Seroprevalence of HBsAg was 11 (3.3%) (95% CI 1.5% - 5.0%). Among 11 HBsAg-positive women, 2 (18.2%) were also positive for HBeAg.

3.3. The Obstetric and Surgical Related Factors of HBV Infection

Regarding the previous place of delivery, 5.5% were positive for HBV, who delivered at home. In addition, 4.3% HBV infection was directly related to a history of abortion and previous contact with liver disease. Almost all participants with HBsAg positivity were multigravida, and 6 (4.2%) were in the

third trimester. 129 (38.2%) had a blood transfusion history, of which 6.2% were positive for HBsAg. (Table **2**).

3.4. Associated Risk Factors of HBV Infection

In bivariate analysis, the six variables, mean age, marital status, body tattooing, history of surgical procedure, history of blood transfusion, and previous contact with liver disease were statistically candidate variables for HBV infection with P-value less than 0.25.

In multivariate analysis, a history of blood transfusion [AOR=4.8; 95% CI (1.25-6.69)] and contact with a family history of the liver [AOR=5.7; 95% CI (1.28-7.9)] were found to be significant independent predictors of HBV infections (Table **3**).

Table 1. Socio-demographic characteristics of pregnant women attending the antenatal clinic at Sankura Primary Hospital, April-June, 2020 (n=338).

Variable	Category	Number (%)
Age(in a year)	17-20	58(17.2)
	21-25	72(21.3)
	26-30	113(33.4)
	31-40	95(28.1)
Residence	Urban	88(26.0)
	Rural	250(74.0)
Marital status	Single	22(6.5)
	Married	316(93.5)
Educational status	No formal education	202(59.8)
	Primary school	118(34.9)
	Secondary school & above	18(5.3)
occupation	Employed	30(8.9)
	House wife	191(56.5)
	Daily laborer	63(18.6)
	Merchant	35(10.4)
	Student	19(5.6)

Table 2. Obestric characteristics of pregnant women attending the antenatal clinic at Sankura Primary Hospital, April-June, 2020(n=338).

Variable	Category	HBV Status of Pregnant Women (n=338)		Total
		Yes	No	
Gravidity	First	1(1.4%)	71(98.6%)	72(21.3%)
	Second and above	10(3.8%)	256(96.2%)	266(78.7%)
Gestational Age	1st trimester	1(3.8%)	26(96.2%)	27(8%)
	2nd trimester	4(2.5%)	158(97.5%)	162(47.9%)
	3rd trimester	6(2.9%)	143(95.8%)	149(44.1%)
Previous place of delivery	No birth	3(3.1%)	94(96.9%)	97(28.7%)
	Home	2(5.5%)	34(94.5%)	36(10.7%)
	Health Inistitution	6(2.9%)	199(97.1%)	205(60.7%)
History of abortion	Yes	4(4.3%)	90(95.7%)	94(27.8%)
	No	7(2.9%)	237(97.1%)	244(72.2%)
Body tattooing	Yes	3(9.7%)	28(90.3%)	31(9.2%)
	No	8(2.6%)	299(97.4%)	307(90.8%)
Admision history	Yes	7(3%)	224(97%)	231(68.3%)
	No	4(3.7%)	103(96.3%)	107(31.7%)
History of surgical procedure	Yes	2(7.7%)	24(92.3%)	26(7.7%)
	No	9(2.9%)	303(97.1%)	312(92.3%)
History of blood transfusion	Yes	8(6.2%)	121(93.8%)	129(38.2%)
	No	3(1.4%)	206(98.6%)	209(61.8%)
Previous contact with liver disease	Yes	2(4.3%)	12(85.7%)	14(4.1%)
	No	9(2.8%)	315(97.2%)	324(95.9%)

(Table 2) contd.....

Variable	Category	HBV Status of Pregnant Women (n=338)		Total
		Yes	No	
History of multiple sexual practices	Yes	1(4.2%)	23(95.8%)	24(7.1%)
	No	10(3.2%)	304(96.8%)	314(92.9%)
Circumcision	Yes	6(3.4%)	169(96.6%)	175(50.6%)
	No	5(3.1%)	158(96.9%)	163(49.4%)

Table 3. Independent factors associated with HBV infection in multivariate analysis among pregnant women attending the antenatal clinic at Sankura Primary Hospital, April-June, 2020(n=338).

Variable	Total	HBV Status of Pregnant Women (n=338)					
		Positive N (%)	Negative N (%)	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
History of Blood Transfusions							
Yes	129(38.2)	8(6.2)	121(93.8)	4.5(1.18,7.44)	0.03	4.8(1.25,6.69)	0.02
No	209(61.8)	3(1.4)	206(98.6)	1(reference)			
Previous Contact with Liver Disease							
Yes	14(4.1)	2(4.3)	12(85.7)	5.83(1.14, 9.98)	0.04	5.7(1.28,7.9)	0.03
No	324(95.9)	9(2.8)	315(97.2)	1(reference)			

4. DISCUSSION

Early screening of pregnant women for HBsAg is one of the most important tasks to design an effective intervention and control program. Hence, the present study was aimed to assess the prevalence of HBV infection, infectivity, and associated factors among pregnant women attending the ANC clinic of Sankura Primary Hospital, Southern Ethiopia [25]. The seroprevalence of HBsAg in the current study was 11 (3.3%) (95% CI 1.5% - 5.0%). According to theclassification of the WHO, the seroprevalence of HBsAg among pregnant women in this study could be classified as moderate endemicity (2-7%) [26].

The seroprevalence rate of HBsAg in this study was in agreement with the studies conducted in different parts of Ethiopia; 4.4% in Felegehiwot referral hospital, Northwest Ethiopia [22], 3.5% in Dawro zone, south Ethiopia [24],2.4% in East Welega [27], 2.3% in a rural hospital of south Ethiopia [28], 4.5% Atat Hospital, South Ethiopia [29], and 3% in selected health facilities, Addis Ababa, Ethiopia [30]. Similarly, the current result was also consistent with studies that reported 3% in a tertiary hospital in Mwanza, Tanzania [31], 2.1% in Turkey [32], and 2.26% in Bulgaria [33]. This highlights that pregnant women in Ethiopia and other countries may have a similar risk of exposure to and/or rate of HBsAg clearance.

In contrast, our finding was lower than results reported from other parts of Ethiopia; 5.3% in central Ethiopia [34], 7.8% in southern Ethiopia [35], 6.1% in West Hararghe public hospitals,Oromia region, Ethiopia [36] and 7.9% in Gambella, south-west Ethiopia [37]. Moreover, the present result was found to be lower than the figures reported; 10.2% in Cameroon [38] and 12.3% in the Gambia [39]. This lower prevalence might be due to differences in the prevalence of HBV in the general population, sample size, local risk factors, and methods used for testing HBV. On the other hand, the prevalence of HBsAg in this study was higher than the prevalence rates of 0.9% reported in brazil [40] and 0.9% in India [41]. The difference in seroprevalence of HBV infection might be attributed to the difference in screening and vaccination coverage for HBV.

Perinatal transmission of HBV is strongly associated with HBeAg- positivity in childbearing women and implies the highest risk for developing chronic HBV infection with 85% to over 90% of babies born to HBeAg positive mothers becoming chronic HBV carriers [35]. However, only 18.2% were positive for HBeAg out of all HBsAg positive pregnant women. This finding was higher compared to studies conducted in Addis Ababa, Ethiopia 12.5% [30] Cameroon 12.1% [38], and Tanzania 9% [31]. In contrast, lower results were reported compared to findings reported by Yirgalem hospital, South Ethiopia, 38.8% [42]. Conflicting results were reported regarding the infectivity of HBV in African countries, therefore, further investigation is needed to resolve this issue.

In this study, sociodemographic variables like age, marital and educational status, residence, and occupation of participants as well as reproductive variables like gestational age and gravidity, were not significantly associated with the risk of HBV infection. This finding concurred with the study conducted in Felege Hiwot Referral Hospital, Ethiopia [22] and Atat Hospital, Southern Ethiopia [29]. However, in contrast, some studies showed that pregnant women with no formal education had higher odds of HBV infection [21].

In the current study, pregnant women who had a history of blood transfusions were almost five times more likely to have the risk of acquiring HBV infection compared to those who had no blood transfusion history. This result is in line with the findings in Atat Hospital, Southern Ethiopia [29], Felegehiwot referral hospital, Northwest Ethiopia [19], and Nigeria [38]. This may be explained because of the hepatitis B virus is transmitted through any fluid, mucosal blood contact from infected patients easily.

Pregnant women who had contact with a family history of liver disease were more than 4 times more likely to be infected

with HBV than women who had no contact with a family history of liver disease, which is consistent with a study conducted in Cameroon [38]. This can be explained by the fact that HBV can be transmitted by contact with fluids secreted from an infected individual.

Factors significantly associated with HBV infection in other studies were not found in this study. The lack of significance for other characteristics may be due to the small number of HBsAg positive cases that could conceal significant results in the logistic regression. Therefore, additional studies with larger sample sizes are necessary to confirm these results.

Our study has some limitations. First, we used rapid diagnostic tests, which are less sensitive than ELISA or PCR tests, leading to a possible underestimation of the prevalence of assessed markers. Second, we determined the HBV infectivity based on HBeAg only, and we did not look for anti-HBe antibodies and HBV viral load, which are also important determinants of HBV transmission. Despite these shortcomings, this study gives important information about HBV infection in pregnant women in a setting of very limited epidemiological data.

CONCLUSION

The prevalence of HBV infection among pregnant women is intermediate. The rate of HBV infectivity was 18.2% of HBsAg-positive women having evidence of HBeAg in their plasma. A higher risk of HBV infection was observed among pregnant women who had a history of contact with a family history of liver disease and who had a blood transfusion. The relatively low prevalence of women positive to both HBsAg and HBeAg in the study population suggests that perinatal transmission of HBV might not be the major mode of HBV transmission in this area. Further studies are needed to assess thoroughly the burden and determinants of MTCT of HBV in this setting. Therefore, the Ministry of Health, local government, and other concerned organizations should take note to increase the screening of pregnant women and vaccination of HBV.

LIST OF ABBREVIATIONS

HBV	=	Hepatitis B Virus
HBsAg	=	Hepatitis B Surface Antigen
Anti-HBc	=	Antibody to core Antigen
Anti-HBs	=	Antibodies to Surface Antigen
HBIG	=	Hepatitis B Immunoglobulin

AUTHORS' CONTRIBUTIONS

BA and SK designed the study; BA contributed to the laboratory work; all authors performed the statistical analyses, interpretation and contributed to the write-up. All authors read and approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Werabe University Research Review committee. Ethical approval was given on 12/05/2020 with the number WRU/RPD/9/135/2020.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

The study was conducted with written consent that assures the willingness of each subject to participate in the study.

STANDARDS OF REPORTING

STROBE guidelines were followed in this study.

AVAILABILITY OF DATA AND MATERIALS

There is no remaining data and material; all information is presented in the main manuscript.

FUNDING

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CONFLICT OF INTEREST

The authors declare that there is no competing interest.

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