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Sero-prevalence and Risk Factors Associated with Hepatitis B Virus Infections among Pregnant Women at Shone Hospital, Southern Ethiopia: A Cross-sectional Study

Mekete Firde (BSc)[1], Hassen Mosa (MSc)[2*], Ritbano Ahmed (MSc)[3], Minychil Demelash (MSc)[2], Fitusm Endale (MSc)[4]

[1] Clinician, Male Ajo health center, South Omo, Jinka, Southern Ethiopia
[2] Lecturer, Department of Midwifery, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia
[3] Assistant professor, Department of Midwifery, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia
[4] Lecturer, Department of Public Health, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia

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ABSTRACT

Background & aim: Hepatitis B virus (HBV) is a serious liver infection that affects millions of people around the world. The risk of vertical transmission from an infected woman to her fetus is extremely significant when HBV is identified during pregnancy. As a result, the goal of this study was to determine the seroprevalence of HBV infections and its associated risk factors among pregnant women attending antenatal clinic (ANC).

Methods: A hospital-based cross-sectional study was conducted on 245 pregnant women attending an antenatal clinic at Shone hospital, Southern Ethiopia from October to December 2020 using a systematic sampling procedure. The data was collected using a structured and pre-tested questionnaire. An enzyme linked immunosorbent assay (ELISA) was used to detect the Hepatitis B surface antigen (HBsAg).The data was analyzed using SPSS (version 24.0). With a 95 percent confidence interval (CI), multivariable logistic regression analysis was conducted to assess the relationship between the independent and the dependent variable.

Results: The rate of HBV infection was found to be 4.9%. Abortion (AOR=6.5; 95% CI: 2.20-24.27), blood transfusion (AOR=4; 95% CI: 1.34-13.87), body tattooing (AOR=6.3; 95% CI: 2.30-22.36), and having multiple sexual partners (AOR=11.4; 95% CI: 4.51-17.23) were the contributing factors of HBV.

Conclusion: Considering that HBV is an intermediate trouble in the study region, enhancing antenatal health education programs on HBV transmission and prevention, adhering to infection prevention principles throughout procedures, and testing every pregnant woman for HBV during an ANC visit are all critical steps in limiting the spread of the illness.

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Introduction

Hepatitis B is caused by the hepatitis B virus (HBV), an encapsulated deoxyribonucleic acid (DNA) virus that infects the liver. Hepatic cells become inflamed and die. HBV is a virus that can cause acute or chronic infection (1). The occurrence of distinct onset of symptoms and jaundice distinguishes acute HBV from chronic HBV. However, there are no signs associated with chronic HBV. In general, HBV infection can last a long time, leading to cirrhosis, liver carcinoma, liver failure, and death. Furthermore, chronicity affects approximately 5% of adults; it affects 90% of newborns (2, 3). In 2015, the World Health Organization (WHO) projected that 257 million people worldwide we re infected with HBV. Only the African and Western Pacific areas accounted for the majority of the disease (68%) (4). Chronic HBV complications are responsible for a bout 40% of cases of hepatocellular carcinoma, t

* *Corresponding author:* Hassen Mosa, Lecturer, Department of Midwifery, College of Medicine and Health Sciences, Wachemo University, Hossana, Ethiopia. Email: hassenmosa17@gmail.com

he world's second greatest cause of cancer-related mortality. Furthermore, chronic HBV has a significant human and economic effect (5). Hepatitis acquired during pregnancy can also result in complications for both the mother and the fetus. Acquired fetal and neonatal hepatitis impairs children's emotional and physical development in later life (6).

The infection with HBV is associated with a variety of risk factors. In higher and moderate endemic locations, vertical transmission from in fected mothers to their offspring is the primary mode of infection (7). HBV may also be spread by unprotected sexual contact, infected blood transfusions, unsafe injections, and needle and syringe sharing (8). Many of the problems associated with HBV disease are caused by infections contracted before the age of five years (4). As a result, the prevention of HBV infection focuses on children under the age of five. The accumulated incidence of chronic HBV infection at five years of age was chosen by the United Nations as a predictor of the Sustainable Development Goal target for preventing hepatitis (9). Routine vaccination began in Ethiopia in 1980. However, in most Ethiopian health facilities, infant immunization is not done on a daily basis (10). It is estimated that more than five million Ethiopians suffer from chronic HBV infection (11). However, there is a scarcity of knowledge about HBV infection in Ethiopia, particularly among pregnant mothers. Furthermore, the results of these studies showed an obvious regional disparity. In Addis Ababa and Dire Dawa, for example, the rate of HBV among pregnant women was 2.3 and 8.4 %, respectively (12, 13). Besides, the factors that contribute to HBV infections vary from one area to the other (12-16). Consequently, in order to devise preventive measures, it is imperative to assess the extent and predictors of HBV in a specific geographical setting. As a result, the goal of this study was to determi ne the prevalence of HBV infections and the its associated risk factors among pregnant women attending an antenatal care (ANC) clinic at Shoe Hospital in Southern Ethiopia.

Materials and Methods

From October to December 2020, a hospital-based cross sectional study was conducted at the Shone Hospital in Hadiya Zone, Southern Ethiopia. One primary hospital, one health center and six health posts serve Shone. Shone Hospital is the only hospital in the town of Shone. It is located 332 kilometers from capital Ethiopia, Addis Ababa. The population of the town is 15,526 people. There are 3618 women of reproductive age among this group.

The source population included all pregnant mothers who visited the Shone Hospital's ANC Clinic during the study period. Pregnant women who sited the Shone Hospital's ANC clinic were included in the study population during the study period. However, the study did not include pregnant women who were extremely ill and had been immunized against HBV. The sample size was calculated using a single population proportion formula that took into account a 6% HBV rate from prior studies (17), a 3% margin of error, a 95% confidence interval (CI), and a 5% non-response rate. Finally, the sample size computed was found to be 253. Pregnant women were recruited using a systematic sampling strategy. During the three months preceding the commencement of the trial, 713 pregnant women visited the ANC clinic. The sampling interval of three was calculated by dividing this number by the sample size. As a result, every third woman visiting an ANC clinic was enrolled in the study until the desired sample size was reached within the specified time frame.

The data was collected using a standardized and pre-tested questionnaire. The questionnaire was developed using tools that have previously been used in relevant investigations (12-16). The validity of the questionnaire was examined using appropriate validity criteria (content validity). The data collecting tool was designed to gather information about the study participants' socio-demographic, obstetrics, cultural, and behavioural factors. Four BSc degree midwives and two laboratory technologist were hired to collect the data. For supervision purpose, one MSc midwife was appointed. To verify the consistency of the data, the English version of the questionnaire was first translated into the local language and then back into English by specialists. Before the study period, a pre-test was conducted at the Shone health center on 5% of the sample size. Based on the results of the pre-test, the questionnaire was

amended. A reliability test was undertaken after the pre-test, and the internal reliability (coefficient alpha) of the questionnaire was observed to be 0.89.

The instrument and data collection technique that compose the study's relevance were thoroughly trained for two days by data collectors and supervisors. Also, the data collectors were worked under thorough follow-up of supervisors. Similarly, at the end of the data collection period, the supervisors and investigators examined the questionnaires for completeness each day. Furthermore, before beginning statistical analysis, the acquired data was thoroughly inputted and validated for its clarity.

Following the interview, an experienced laboratory technologist drew three milliliters of venous blood from each study participant using a plain tube. The blood was then allowed to coagulate at room temperature for 30 minutes as directed by the testing kit's manufacturer (Dialab GmbH,Austria). The tube was centrifuged at 800g for 20 minutes, the serum was unglued, transferred to a cryo-tube, and then stored at -20 C. The samples were transported in a cool box to the Hossana Branch of the Red Cross Society Blood Bank Laboratory in Ethiopia for HBV and pregnant women serological testing. Serological screening was performed on the same day as the mother's admission to prevent pre-analytical issues caused by the serum's frequent freeze-thaw cycles. The Dialab HBsAg enzyme linked immunosorbent assay (ELISA) kit (Dialab GmbH, Austria) was used to screen for HBsAg at the Red Cross Society Blood Bank Laboratory, which was able to differentiate all genotypes and subtypes of the virus. The manufacturer's test kit's normal operating protocols were strictly followed to ensure the quality of the laboratory results. All batches of the ELISA test kit were run with the positive and negative controls.

The statistical package for social sciences (SPSS) was used to enter and evaluate the data (version 24.0). To describe the data, descriptive statistics were used, such as frequency and percentage. The primary outcome was a binary variable of HBsAg positivity, which was classified as "positive" if subjects tested positive for HBsAg and "negative" if they tested negative for HBsAg. To determine the relationship between explanatory variables and the result variable, bivariate and multivariable variable logistic regression analysis were utilized. To begin, bivariate logistic regression was performed, with variables with a p-value of less than 0.25 being added into multivariable logistic regression. To find independent predictors of the outcome variable and compensate for potential confounders, multivariable logistic regression was used. To determine the strength of the link, odds ratios with 95 percent confidence intervals were calculated. A p-value of less than 0.05 was used to confirm statistical significance. The HosmerLemeshow statistic showed a significant value of 0.89, indicating that the model was a good fit but not statistically significant. The Wachemo University College of Medicine and Health Science Research and Ethical Review Committee (RERC/0145/2020, Date: 06/09/2020) granted ethical approval. In addition, the Shone Hospital Administration gave their consent. Furthermore, prior to the interview and blood collection, all research participants signed a written informed consent form. The information gathered and the results of laboratory tests were kept under wraps. Individual test results were forwarded to the attending physician for further case management.

Results

Socio-demographic description

This study included a total of 245 pregnant women; resulting in a 100% response rate. The study participants' average age was 28.7 years, with a standard deviation (SD) of 5.08. More than half of the study participants, 161 (65.7%), lived in urban areas, 214 (87.3%) were married, and 191 (78%) were of Hadiya ethnicity. Additionally, 71(29%) of the participants did not have any formal education and 180(73.4%) were housewives. Regarding income, majority of the participants 189 (77.1) have earned a monthly income ≥ 2000 Ethiopian birr (Table 1).

Table 1. Sociodemographic characteristics of mothers at Shone Hospital, 2020

Variables	Frequency (%)
Age in years	
<20	26(10.6)
20-34	162(66.1)
≥35	57(23.3)
Residence	
Urban	161(65.7)
Rural	84(34.3)
Marital status	
Married	214(87.3)
Unmarried	31(12.7)
Educational status	
Have no formal education	71(29)
Primary education	70(28.6)
Secondary education	53(21.6)
College and above	51(20.8)
Occupation	
Housewives	180(73.4)
Government employed	13(5.3)
Daily labourers	18(7.4)
Farmer	23(9.4)
Others[a]	11(4.5)
Ethnicity	
Hadiya	191(78)
Kambata	30(12.3)
Silte	7(2.9)
Gurage	9(3.6)
Amhara	8(3.2)
Parity	
Nullipara	40(16.3)
Primipara	94(38.4)
Multipara	111(45.3)
Average household income in Ethiopian birr	
2000	56(22.9)
≥2000	189(77.1)

[a]= others include: self-employed and student

Sero-prevalence and behavioural related characteristics

The overall prevalence of HBV was observed to be 4.9% (12/245). The other cultural and behavioural characteristics of the respondents are presented in (Table 2).

Factors associated with HBV Infection

The bivariable logistic regression study revealed that having several sexual partners, history of blood transfusion, tattooing, and surgical operation were all substantially linked factors of HBV with a p-value of less than 0.25. In a multivariate logistic regression study, however, only history of abortion, numerous sexual partners, blood transfusion, and tattooing were found to be substantially linked with HBV at a p-value of 0.05.

Pregnant women with a history of abortion had a 6.5 times higher chance of contracting HBV infect ion than pregnant women without a history of abo rtion (AOR= 6.5; 95% CI: 2.2-24.27).

Similarly, pregnant women who had many se xual partners had a 11.4 times higher risk of con tracting HBV than pregnant women who had ne ver had multiple sexual partners (AOR=11.4; 95% CI: 4.51-17.23).

Table 2. Prevalence of HBV, behavioural and cultural related characteristics of mothers Shone Hospital, 2020

Variables	Frequency (%)
Abortion history	
Yes	32(13.1)
No	213(86.9)
Sharing of needle	
Yes	3(1.2)
No	242(98.8)
Multiple sexual partner	
Yes	29(11.8)
No	216(88.2)
HIV status	
Positive	12(4.9)
Negative	233(95.1)
Tattooing	
Yes	30(12.2)
No	215(87.8)
Nose piercing	
Yes	31(12.7)
No	214(87.3)
Uviloctomy/tonsillectomy	
Yes	45(18.4)
No	200(81.6)
Surgical procedure	
Yes	43(17.6)
No	202(82.4)
Blood transfusion	
Yes	35(14.3)
No	210(85.7)
Status of mothers HBV	
Yes	12(4.9)
No	233(95.1)

Table 3. Associated factors of HBV among pregnant women attending ANC at Shone Hospital, 2020.

Variables	HBV		COR(95% CI)	AOR(95%CI)
	Yes	No		
History of abortion				
Yes	12	20	7 (2.29-26.50)*	6.5(2.20-24.27)**
No	17	196	Reference	Reference
Multiple sexual partner				
Yes	8	20	12(6.91-22.21)*	11.4(4.51-17.23)**
No	7	210	Reference	Reference
Tattooing				
Yes	10	20	6.7(2.90-29.14)*	6.3(2.30-22.36)**
No	15	200	Reference	Reference
Blood transfusion				
Yes	5	33	4.3(2.29-14.45)*	4(1.34-13.87)**
No	7	200	Reference	Reference
Surgical procedure				
Yes	8	30	1.7(1.29-10.23)*	1.2(0.8-7.76)
No	27	180	Reference	Reference

* P ≤ 0.25, **p < 0.05, COR: Crude odds ratio, AOR: Adjusted odds ratio

In addition, pregnant women who had previously received blood transfusions were four times more likely to contract HBV than those who had never received blood transfusions (AOR=4; 95% CI:1.34-13.87).

Furthermore, pregnant women with a history of tattooing on any area of their body were more likely to contract HBV (AOR=6.3; 95% CI: 2.30-22.36) (Table 3).

Discussion

The sero-prevalence of HBsAg was 4.9% among pregnant women attending ANC, according to the findings of this study. According to WHO criteria, endemicity of HBV infection is divided into three categories: low (2%), moderate (2% to 7%), and high (8%) (1).

In this study, the result indicated intermediate endemicity area. This result is analogous with studies carried out in Felegehiwot referral hospital, Attat hospital, Arba Minch and Dessie referral hospital which were 4.7, 4.5, 4.3 and 4.9%, respectively (16-19). This resemblance may be attributed to the similarity of sociodemographic characteristics and HBsAg infection screening techniques. However, this figure is greater than observed in studies undertaken in Ghandi, and Bahir Dar city, which were 2.3 and 3.8%, respectively (12, 20). Conversely, this research found a lesser rate of HBV in comparison to research conducted in Dire Dawa, Gambela hospital, Hawassa referral hospital, Deder hospital which were 8.4, 7.9, 7.8 and 6.9%, respectively (13, 15, 21, 22). The discrepancy might be differences in methods used to screen HBV, socio cultural and behavioural practices.

Furthermore, when compared to studies conducted in other countries such as Nigeria, Ghana, Uganda, and Mali, which revealed prevalence rates of 12, 10.6, 11.8, and 8%, respectively, this study indicated a reduced prevalence of HBV (23-26). Differences in sampling procedure, topographical variance, cultural and behavioural variables about the potential risk factors of HBV infection, and dissimilarities in the test methodologies use to identify HBV infection could all contribute to the discrepancy. In the UnitedStates, Brazil, Kenya, Saudi Arabia, and Turkey, however, lower rates of 0.14 to 0.97, 0.9, 1.5, 1.6, and 2.1 percent were found, respectively (27-31).

This discrepancy could be explained by the fact that rich countries have better HBV screening and immunisation than underdeveloped countries.

Multiple sexual partners were found to have a statistically significant link to HBV infection. The reason for this could be that HBV is a bloodborne virus; blood, sperm, and other bodily fluids are the most common sources of infection, and sexual contact is the most common means of transmission. As a result, sexually active women are more likely to have the virus, especially if they have had several sexual partners in the past. This is supported by research from Gambela, Dessie, and Legos Nigeria (15, 19, 32).

Furthermore, having an abortion history was associated with HBV infection in a statistically meaningful way. This could be because of unintended pregnancy is associated with unprotected sexual intercourse which might causes an abortion and rises the possibility of acquiring HBV infection if their partners are infected. This is consistent with studies conducted at Bahir Dar, Deder, Nigeria, and Iran (20, 22, 33, 34).

Body tattooing has also been linked to HBV infection in statistically meaningful ways. The explanation for this could be that tattooing is done in a conventional manner without using any sterilization techniques. As a result, the virus spreads easily from the career to the healthy mother. This finding is consistent with prior research from Addis Ababa, Bahir Dar, and Bamako (Mali) (12, 20, 35). However, this finding contradicts the findings of previous investigations (15, 18).

Blood transfusion history was found to be an independent risk factor for HBV infection. This is explained by the fact that the hepatitis B virus can easily be spread from infected patients through any fluid/mucosal/blood contact. This finding is consistent with research conducted in Felegehiwot, Bahir Dar, Tanzania (16, 20, 36). Other reports from Dessie (19) and Bahrdar (20) were, however, in conflict with the findings of this study. Variations in sample size, study time, and inadequate execution of infection

prevention programs could explain the disparity.

The fact that respondents were registered using the probability sampling technique to maintain the study's representativeness, and that multiple techniques were utilized to maintain the data quality, are among the study'smerits. This research, however, has several drawbacks. Because this study used a cross-sectional methodology, it was difficult to demonstrate causal relationships. The study's additional shortcomings were the use of solely HBsAg markers and the lack of HBeAg and DNA laboratory diagnostic techniques for determining HBV infection.

Conclusion

Based on WHO categorization criteria, the prevalence of HBV infection was classified as an intermediate endemic in this study. HBV infection was substantially related with multiple sexual partners, abortion history, blood transfusion, and body tattooing. As a result, enhancing antenatal health education programs on HBV transmission and prevention, adhering to infection prevention principles throughout procedures, and testing every pregnant woman for HBV during an ANC visit are all critical steps in limiting the spread of the illness. Advanced diagnostic technologies, such as polymerase chain reactions, should be used in future investigations to help identify occult HBV infection.

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Conflicts of interest

Authors declared no conflicts of interest.

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