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Seroprevalence of Hepatitis B Virus Infection and Associated Factors among Pregnant Women Attended Antenatal Care Services in Harar City, Eastern Ethiopia

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Abstract

Background: Hepatitis B virus (HBV) infection is a serious public health problem in worldwide and the major cause of morbidity and mortality. Globally, 350 million people are chronically infected with hepatitis virus and more than 68,600 people die of HBV infection. Pregnant mother infected with Hepatitis B virus has a high rate of vertical transmission, causing adverse fetal and neonatal outcome. Understanding the epidemiology of Hepatitis virus could have paramount importance to take appropriate preventive measures. The world health organization recommends screening of all pregnant mothers. However, this practice is poor currently in Ethiopia. Hence, this study aims to assess the prevalence of hepatitis B virus infection and associated factors.

Methods: Cross-sectional study was conducted in selected governmental health facilities of Harar city from March to April 2017. Systematic random sampling technique was used to select 326 study participants. Data were collected using pretested interviewer administered questionnaire. Serum was withdrawn from each study participants and used to detect hepatitis B Antigen surface using an enzyme linked immunosorbent assay test kit. Descriptive, bivariate and multivariate logistic regression analysis was done to identify independent predictors of hepatitis B virus infection after controlling for confounding variables.

Result: Prevalence of hepatitis B virus among pregnant mothers was found to be 6.3%. In multivariate analysis; blood transfusion [AOR=9.7, 95% CI (1.6, 57.5)], history of surgical procedure [AOR=4.1, 95% CI (1.1, 16.8)], history of sexually transmitted infection [AOR=10.1, 95% CI (2.9, 34.7)], being HIV positive [AOR=13.1, 95% CI (1.8, 95.6)] and history of tooth extraction [AOR=5.5, 95% CI (1.4, 22.1)] were independent predictors of HBV infection.

Conclusion: HBV infection is intermediate endemicity in the study area. Higher prevalence of HBV infection was identified among mothers with history of blood transfusion, history of surgical procedure, history of STI, HIV positive and history of tooth extraction.

Keywords: Seroprevalence; Hepatitis B virus; Immunoprophylaxis; Antenatal care

Abbreviations: ANC: Antenatal Care; AOR: Adjusted Odd Ratio; CI: Confidence Interval; COR: Crude Odd Ratio; DNA: Deoxyribonucleic Acid; EILSA: Enzyme-Linked Immunosorbent Assay; HBIG: Hepatitis B Immunoglobulin; HBsAg: Hepatitis B Surface Antigen; HBV: Hepatitis B Virus; HFUSH: Hiwot Fana University Specialized Hospital; HIV: Human Immune Deficiency Virus; PNC: Postnatal Care; STI: Sexually Transmitted Infection

Background

Hepatitis B infection is caused by the hepatitis B virus (HBV), an enveloped Deoxyribonucleic Acid (DNA) virus that infects the liver, causing hepatocellular necrosis and inflammation [1]. HBV infection is a serious global health problem, with 2 billion people infected world-wide, and 350 million suffering from chronic HBV infection and the 10th leading cause of death worldwide [2-5]. Approximately 75% of chronic carriers live in Asia and the Western Pacific [4]. The prevalence of chronic HBV infection varies geographically, from high (>8%), intermediate (2-7%) to low (<2%) prevalence [2]. Thus, Ethiopia belongs to the high prevalence category [6]. Chronic active hepatitis B virus infection results in cirrhosis and hepatocellular carcinoma. Globally, it was estimated that in 2010, about 248 million individuals were hepatitis B surface antigen (HBsAg) positive [7].

Hepatitis B virus has a high rate of vertical transmission, causing fetal and neonatal hepatitis [8,9]. Additionally, mother-to-child transmission of HBV infection predisposes to carriage, liver cirrhosis, and hepatocellular carcinoma in young adults. Thus, acute hepatitis B in pregnancy presents risks not only for the mother but also for the newborn [8,10]. Prevention of vertical transmission is extremely important because HBV infection in early life can result in a chronic carrier state. As shown in earlier studies, administration of hepatitis B immunoglobulin (HBIG) to HBsAg-positive mothers reduced the rate of vertical transmission to 23%, and the combination of HBIG and hepatitis B vaccination reduced transmission even further to 3% [11-13]. Acute hepatitis in pregnancy has been shown to induce premature labor [11,14,15].

The expanded programme on immunization was launched in 1980 with the objective of increasing the coverage by 10% annually. Nevertheless, the immunization policy was updated in 2007 which enrolled childhood immunization against HBV in a pentavalent form at the age of 6, 10 and 14 weeks after birth [16]. The risk of HBV transmission decreases in a setting where there is a periodic perinatal HBV screening, immunoprophylaxis given to infants born to HBV infected mothers and hepatitis B vaccine administered both to high risk mothers and to all newborn infants [9]. It is currently recommended that all pregnant women should undergo screening for hepatitis B virus at presentation for prenatal care and vaccination of their babies at birth has been recommended widely, yet it is not a routine practice in most health settings of Ethiopia [16]. More than 5 million people are living with chronic HBV infection among the general population of Ethiopia [7]. A nation-wide study done in Ethiopia, indicated with an overall HBV seroprevalence of 10.8% [17]. Several studies conducted in different parts of Ethiopia, Jima (south-west), Bahir Dar and Gondar (north-west) showed a seroprevalence of HBV infection among pregnant women 3.7%, 3.8% and 7.3% respectively [18-20]. Whereas, two different studies conducted in Bishoftu hospital and Addis Ababa showed a sero-prevalence of 5.4% and 3% respectively [21,22].

Prevalence of HBV infection in Ethiopia has been previously done and indicated that hepatitis B is endemic in Ethiopia with regional variation [7,9,18-20,23]. However, laboratory investigation of HBV infection is not routinely given as a package with antenatal care services and this overlooked the severity of the problem. Moreover, predictors of Hepatitis B virus infection varied from region to region. Thus, determining the seroprevalence and associated factors with HBV infection in different geographical setting has paramount importance to design appropriate preventive measures and antenatal care screening would get an emphasis. Hence, this study aimed to assess the seroprevalence of HBV infection and associated factors among pregnant women attended antenatal care services in Harar health institutions, Eastern Ethiopia.

Methods

The study was conducted in Harar city, Eastern Ethiopia which is located 525 km away from the capital city Addis Ababa. The population of the city is estimated to be 240,000 and 53,383 were women of reproductive age group. There are 6 hospitals (4 government and 2 private hospitals) and 8 health centers which are giving antenatal care (ANC), delivery and postnatal care (PNC) services. The total number of eligible population in the city for ANC, delivery and postnatal care was around 7604 [12].

This cross-sectional study was carried out from March 2017 to April 2017 in Harar city, Eastern Ethiopia. The study participants were enrolled from the randomly selected 2 hospitals and three health centers. To select sample size from the selected health facilities, proportional allocations were done for each health facilities and Systematic random sampling technique was used to select a total of 326 study participants from selected health institutions (Figure 1).

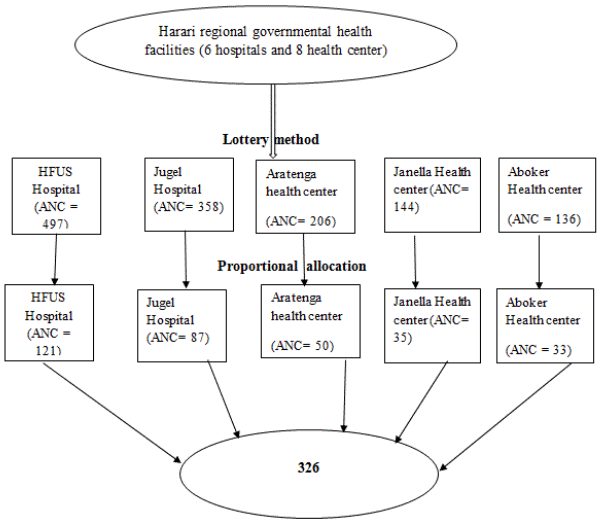

Figure 1: Schematic diagram of study population and sampling distribution in HIs of Harari regional state, 2017.

Study participant

The study population was all pregnant women who attended ANC clinic for check-up services in Harar city selected governmental health facilities. All pregnant women with confirmed pregnancy were enrolled in this study. Pregnant mothers who attended the clinic for more than one visit during the study period were excluded. To avoid this, a unique mark was put on cards of all enrolled mothers.

Sample size calculation

The single population proportion formula was used to determine the sample size by considering 7.3% prevalence of HBV [20], 95% CI and a 3% margin of error and considering 5% non-response rate, the total sample size was determined to be 326. Accordingly, a total of 326 study participants were included. The number of participants in each of the selected health institutions were allocated proportionally based on the previous registered annual number of clients and a systematic random sampling technique was used to select the study participants.

Data quality control

Information on socio-demographic and other pertinent data was collected by trained data collectors using a pre-tested standard questionnaire adopted from the World Health Organization (WHO) "Protocol for assessment of hepatitis B infection in antenatal patients" [24]. The collected data were checked daily for consistency and accuracy. Questionnaires developed in English have been translated in to Amharic and Afan Oromo language and again translated back into English by language experts to ensure its consistency. Moreover, pretest was done on 5% of sampled pregnant women at the health institution other than the actual study sites.

Laboratory investigation HBsAg

Three milliliters of venous blood were collected using plain tube by an experienced laboratory technologist from each study participant.

Afterwards, the presence of HBsAg in serum was detected using Enzyme-Linked Immunosorbent Assay (EILSA) (Linear chemicals. Joaquim, Costa, Barcelona, Spain) according to the manufacturer's instructions. Procedures were strictly followed during blood sample collection, storage and analytical process. Positive and negative controls were run alongside of the test.

Data Processing and Analysis

The data were first coded, double data entry were done by two data clerks and consistency of the entered data were cross checked by comparing the two separately entered data and cleaned using EpiData statistical software version 3.1. Entered data exported into statistical package for social science (SPSS) software version 21 for analysis. Descriptive statistics of different variables were determined and the results were presented in texts and tables using summery measures such as percentages, mean and standard deviation. Hosmer-Lemeshow's and Omnibus goodness-of-fit test was used to assess whether the necessary assumptions for the application of bivariate and multivariate logistic regression. In the Hosmer-Lemeshow test, the Pearson's chi-square should not be significant but it should be significant in Omnibus test if the model said to be fitted. Bivariate logistic regression was carried out to identify the predictors associated with HBV infection. All variables with p-value of ≤ 0.25 in bivariate logistic regression were taken into multivariable model. In the multivariate analysis, standard enter techniques were fitted. Variables having p value ≤ 0.05 in the multivariate analysis were taken as significant predictors. Crude odd ratios (COR) and adjusted odds ratios (AOR) with their 95% confidence intervals (CI) were calculated.

Result

Socio-demographic characteristics of the participants

A total of 320 pregnant women were participated in this study giving a response rate of 98.2%. The age of the study participants varied between 18 and 40 years with a mean age of 25.6 ± 6.0 years. Nearly two third (64.6%) of the study participants, were living in urban areas and majority (87.8%) of the study participants were married. About 217 (68.8%) of the study participants were secondary school and above (Table 1).

Variable		Frequency	Percentage (%)
Age	<21	52	16.3
	21-25	98	30.6
	26-30	110	34.4
	31-35	43	13.4
	>35	17	5.3
Residence	Urban	207	64.6
	Rural	113	35.4
Marital status	Single	13	4.1
	Married	281	87.8
	Divorced	12	3.8
	Widowed	14	4.3
Ethnicity	Oromo	135	42.2
	Amhara	78	24.4
	Harari	50	15.6
	Others*	57	
Educational status	No formal education	35	10.9
	Primary	65	20.3
	Secondary school and above	220	68.8
Occupation	Farmer	20	6.3
	Health worker	19	5.9
	House wife	104	32.5
	Daily laborers	27	8.4

	Others	150	46.9

Table 1: Socio-demographic characteristics of pregnant women attending ANC service in health institutions of Harar city, Eastern Ethiopia, 2017(n=320).

Prevalence of Hepatitis B virus infection

Out of 320 pregnant mothers, tested for HBsAg 20 (6.3%) were positive for HBV infection. Our study showed that the prevalence of HBV infection was higher among pregnant mothers; HIV positive 4 (36.3%), previous history of blood transfusion 3 (25%) and history of multiple sexual partner 4 (20%). HBV infection was common across each age group distribution of participants and highest prevalence was observed 4 (9.3%) among age group of 31-35. The study also indicated that HBsAg positivity was increased among respondents' educational status across each sub category (Table 2).

Variables		HBsAg status
		Positive n (%)
Age	<21	1 (1.9)
	21-25	5 (5.1)
	26-30	9 (8.1)
	31-35	4 (9.3)
	>35	1 (5.9)
Residence	Urban	13 (6.3)
	Rural	7 (6.2)
Marital status	Single	1 (7.7)
	Married	16 (6.4)
	Divorced	2 (16.7)
	Widowed	1 (7.1)
Ethnicity	Oromo	6 (4.4)
	Amhara	3 (3.8)
	Harari	6 (12)
	Others*	4 (7)
Educational status	No formal education	1 (2.9)
	Primary	4 (6.2)
	Secondary school and above	15 (6.8)
Occupation	Farmer	2 (10)
	Health worker	1 (5.3)
	House wife	7 (6.7)
	Daily laborers	2 (7.4)
	Others	8 (5.3)
Gravidity	Primigravida	3 (4.4)
	Multigravida	17 (6.7)
Para	Nullipara	0 (0)
	Multipara	20 (6.3)

History of blood transfusion	Yes	3 (30.8)
	No	17 (5.7)
History of surgical procedure	Yes	7 (15.2)
	No	13 (4.7)
History of STI	Yes	12 (19.4)
	No	8 (3.1)
History of multiple sexual partner	Yes	4 (20)
	No	16 (5.3)
HIV status	Positive	4 (36.3)
	Negative	16 (5.2)
History of tooth extraction	Yes	9 (14.3)
	No	11 (4.3)
History of hospital admission	Yes	8 (14.5)
	No	12 (4.5)
Home delivery	Yes	4 (7)
	No	16 (6.3)

Table 2: prevalence of HBV infection among pregnant women attending antenatal care service in health institutions of Harar city, Eastern Ethiopia, 2017(n=320).

Factors associated with Hepatitis B virus infection

In multivariate analysis model, there were a statistically significant positive association with HBV infection among pregnant mothers who had previous history of blood transfusion [AOR=97, 95% CI (1.6, 57.5)] and history of surgical procedure [AOR=4.1, 95% CI (1.1, 16.8)]. Similarly, pregnant mothers with history of STI infection [AOR=10.1, 95%CI (2.9, 34.7)] and being HIV positive [AOR=13.1.1, 95% CI (1.8, 95.6)] were increased the odds of acquiring HBV infection compared to their counterparts. Moreover, having previous history of tooth extraction was more likely to be infected [AOR= 5.5, 95% CI (1.4, 22.1)] compared to their counterparts (Table 3).

Variables		HBsAg status		Crude odd ratio (95% CI)	Adjusted odd ratio (95% CI)
		Positive (%)	Negative (%)		
Age	< 21	1 (1.9)	51 (98.1)	1	
	21-25	5 (5.1)	93 (94.9)	0.4 (0.04, 3.2)	0.7 (0.05, 8.7)
	26-30	9 (8.1)	101 (91.9)	0.3 (0.03, 2.4)	0.8 (0.06, 11.4)
	31-35	4 (9.3)	39 (90.7)	0.2 (0.02, 1.8)	0.7 (0.05, 11)
	>35	1 (5.9)	16 (94.1)	0.3 (0.02, 5.3)	2.6 (0.06, 112)
Educational status	No formal education	1 (2.9)	34 (97.1)	1	
	Primary	4 (6.2)	61 (92.4)	0.4 (0.04, 3.2)	0.5 (0.04, 5.7)
	Secondary school and above	15 (6.8)	205 (93.2)	0.4 (0.06, 3.40	0.6 (0.06, 5.5)
Gravidity	Primigravida	3 (4.4)	67	1	1
	Multigravida	17 (6.7)	233 (93.3)	0.2 (0.02, 1.4)	0.5 (0.04, 5.3)
History of blood transfusion	yes	3 (30.8)	9 (75)	10 (3, 33.6)	9.7 (1.6, 57.5)**

	No	17 (5.7)	291 (94.3)	1	1
	Yes	7 (15.2)	39 (84.8)	3.3 (1.3, 8.8)	4.1 (1.1, 16.8)*
History of surgical procedure	No	13 (4.7)	261 (95.3)	1	1
	Yes	12 (19.4)	50 (80.6)	6.6 (2.6, 16.6)	10.1 (2.9, 34.7)***
History of STI	No	8 (3.1)	250 (96.9)	1	1
	Yes	8 (14.5)	47 (85.5)	0.3 (0.1, 0.7)	0.6 (0.2, 2.4)
History of hospital admission	No	12 (4.5)	253 (95.5)	1	1
	Yes	9 (14.3)	54 (85.7)	3.4 (1.4, 8.5)	5.5 (1.4, 22.1)*
History of tooth extraction	No	11 (4.3)	246 (95.7)	1	1
	Yes	4 (20)	16 (80)	0.2 (.07, 0.8)	1.2 (0.2, 7.9)
History of multiple sexual partner	No	16 (5.3)	284 (94.7)	1	
	Positive	4 (36.3)	6 (63.7)	19.5 (5.6, 67.8)	13.1 (1.8, 95.6)**
HIV status	Negative	16 (5.2)	294 (94.8)	1	1

Table 3: Bivariate and multivariable analysis of factors associated with prevalence of HBV infection, among pregnant women attending antenatal care service in HIs of Harar city, Eastern Ethiopia, 2017(n=320).

Discussion

The overall seroprevalence of HBV positivity among pregnant mothers attending ANC services in Harar health institutions were 20 (6.3%). According to WHO classification, the prevalence of HBV infection in the study area can be categorized as intermediate endemicity (2%-7%). The prevalence was nearly similar with a finding, 6% in Addis Ababa [25], 5.7% in Shashemene town, West Arsi, Ethiopia [26], 6.6% in Bahir Dar, north west Ethiopia [19], 6.9% in Deder town [9] and 6% in Jigjiga, Eastern, Ethiopia [27]. Likewise, similar prevalence (6%) was detected by two other studies in Nigeria [28,29].

The prevalence of seropositive of HBsAg in our study however, relatively higher in studies reported from Addis Ababa [23], Dawuro [30], Jima [18], Arba Minch hospital [31], Felege Hiwot referral hospital [32] and Dessie referral hospital [33] indicating HBV infection with a prevalence ranging (3-4.9). Comparison to other countries, the prevalence of HBV infection among pregnant mothers was also higher from 1.56%, 3.9%, 4%, 4.1% and 4.7% results reported from Iran [34], Tanzania [35] Egypt [36] and Nigeria [37] respectively.

In contrary to this, higher result was reported from Ethiopia; Mekele (8.1%) and Hawassa (7.8%) respectively [38,39]. Moreover; higher prevalence, 7.5% and 10.2% was also investigated by Mohamed et al. [40] and Noubiap et al. [41] respectively. Variations in sero-prevalence in Ethiopia and elsewhere might be because of differences in geographical regions, socioeconomic status, cultural and behavioral practice towards the risk of HBV infection. Remarkable differences in prevalence of HBsAg are detected among variability in geographic, genetic and ethnic distribution. Furthermore, the discrepancy might be due to the method used for screening of HBsAg.

The finding of this study suggests that pregnant mothers who experienced previous history of sexually transmitted infection (STI) were 10.1 times more likely to be infected by HBV compared to their counter parts. This is due to the fact that history of STI is closely related with involvement in heterosexual practice or having multiple sexual partners and unprotected sexual intercourse. Hence, unprotected sex and history of STI is generally the commonest risk factor for HBV infection [42,43]. Previous studies also evidenced that acquisition of HBV infection is significantly higher among participants involved in heterosexual practice and unsafe sex [9,32,35,39,44,45].

The present study generally reflects that pregnant mothers with history of blood transfusions were 4.1 times at higher risk of acquiring HBV infection compared to their counterparts. Similarly, this finding was in accordance with study reported by Abongaw et al. and Aziz et al. [36,44]. Moreover, studies reported from sub-Saharan countries (Sudan, Cameroon and Nigeria) noted that a statistically significant positive correlation of HBV prevalence was detected among mothers with history of blood transfusion [40,46,47]. This similarity is due to the fact that blood transfusion is a well-established risk factor for HBsAg, and frequency of infection after one pint of blood was almost the same as after multiple transfusions [48]. However, this finding was inconsistent with other investigations carried in different parts of Ethiopia and elsewhere in Africa [25,30,35,45]. This discrepancy might be due to improved quality of laboratory screening for HBV detection among blood donors before the occurrence of transfusion.

Our study revealed that the odds of acquiring HBV infection was elevated among pregnant mothers who had history of surgery, previous investigations notified by Ummer et al. (Deder, Eastern Ethiopia) and Zenebe et al. (Bahir Dar North Ethiopia) proved a positive association for this scenario [19,9]. Likewise, this finding was also in congruent with study conducted in Jima, Addis Ababa and Sudan, in which history of surgery was an independent predictors of HBV infection [18,25,40]. Nevertheless, contraindicated results were reflected from Metaferia et al. and Noubiap et al. [38,41]. Possible reason of discrepancy is due to difference in sample size, variation in study period or substandard infection prevention control measures.

Previous history of tooth extraction was found to be a potential risk factor for HBV infection in our study. Accordingly, having history of tooth extraction among pregnant mothers increased the likelihood of HBV prevalence by 5.5 times compared to their counter parts. Comparing these result to other studies, a consistent finding was carried out by Mohamed et al. and Molla et al. from south west and north west, Ethiopia respectively [18,32]. Moreover, similar finding also investigated in Abia state, Nigeria [45]. This might be due to non-adherence to guidelines on infection control and use of non-disposable or reusable equipments and the lack of sufficient sterilization technology.

We found that Human immune deficiency virus (HIV) infection was highly associated with HBV infection in our study population, with HIV-infected women being around 13 times more likely to be co-infected with HBV than HIV-uninfected ones. This correlation was in line with two other studies reported from Cameroon [41,46]. This can be explained by the fact that HBV and HIV share common modes of transmission. Moreover, it has been reported that HIV/HBV co-infection facilitates HBV replication and reactivation leading to higher HBV-DNA levels and a reduced spontaneous clearance of the virus [49].

This study identified very important variables which assumed to affect HBV infection and proved statistically independent predictors of HBV prevalence. However, solely use of HBsAg markers and lack of HBeAg and DNA laboratory screening for tracing of HBV infection and, Wide confidence interval in the associated factors due course of small sample of HBV positive cases were a limitation of this study, similar draw back also observed in studies reported from Ethiopia and other countries [9,30,41].

Conclusion

An intermediate prevalence (6.3%) of HBV infection was detected in the study area. Our study illustrated that seroprevalence of HBV infection was significantly associated among pregnant mothers with HIV seropositive, history of STI, blood transfusion and surgical procedure. Moreover, having history of tooth extraction was also independent predictors of hepatitis B infection. Therefore, to avert the prevalence and spread of HBV infection, we recommend that health education programs to raise awareness level of the mothers on the mode of HBV transmission and prevention strategies should be instituted at antenatal clinics to create an insight for mothers. Furthermore, there should be routine screening of all pregnant mothers for detection of HBV infection for early immunization of infants from seropositive mothers.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from Institute of Health Research Ethical Review Committee (IHRERC) of Haramaya University College of Health and Medical Sciences, School of Nursing and Midwifery, Ethiopia. Then formal letter of co-operation was written to Harari Regional Health Bureau and to each of selected governmental health institutions. Each study participant was adequately informed about the purpose, method, anticipated benefit and risk of the study. Written informed consent was obtained from study participants. Confidentiality and cultural norms of study participants were also maintained.

Availability of data and material

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

GT designed the study, performed the statistical analysis and drafted the manuscript. KS and FT participated in the study design, implementation of the study, and contributed to the draft manuscript. All authors contributed to the data analysis, read and approved the final manuscript.

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