



ORIGINAL ARTICLE

Sociocultural and Behavioral Factors Contributed to High Hepatitis B Virus Prevalence among Pregnant Women in Hossana Town Central Ethiopia Region: A Cross-Sectional Study

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Abstract

Background: Beyond being associated with adverse health consequences in women, hepatitis B virus (HBV) infection in pregnancy leads to vertical transmission, accounting for almost half of all new HBV infections. The risk factors for HBV infection in pregnancy vary across socio-cultural contexts; there is a lack of information about the issue in the Central Ethiopia Region.

Objective: To assess the prevalence of HBV infection and associated risk factors among pregnant women visiting Hossana Town public health facilities in Central Ethiopia Region.

Methods: We conducted a cross-sectional study from August to September, 2022, among 435 randomly selected pregnant women attending antenatal care clinics. Data for potential risk factors were collected using a structured interviewer-administered questionnaire and HBV infection status was determined via HBV surface antigen (HBsAg) testing using an enzyme-linked immunosorbent assay (ELISA). Logistic regression analyses were performed to ascertain the association between explanatory variables and HBV infection at a P value less than 0.05 with 95% confidence interval (CI).

Results: Of 416 women tested, 34 were found to be positive for HBsAg, giving an overall HBV infection prevalence of 8% (95% CI: 6-11%). Relative to HBsAg negative women, HBV-infected women had around six times higher odds of reporting intimate contact with an HBV-infected person (AOR: 5.77; 95% CI: 1.47-22.5), almost four times higher

odds of reporting a history of tattooing (AOR: 3.79; 95% CI: 1.53-9.37) and almost three times the odds of reporting a history of sexually transmitted diseases (AOR: 2.87; 95% CI: 1.26-6.53).

Conclusions: The prevalence of HBV infection among pregnant women in Hossana Town was found to be among the highest prevalences in similar populations in Ethiopia. As well as unprotected intimate contact with an HBV-infected person, cultural and behavioural factors related to practices of unsafe tattooing and sex, are associated with HBV infection.

Keywords

Hepatitis B virus, Prevalence, Risk factors, Pregnant women, Hossana Town, Central Ethiopia Region

Abbreviations

ANC: Antenatal Care; AOR: Adjusted Odd Ratio; CI: Confidence Interval; COR: Crude Odd Ratio; ELISA: Enzyme-Linked Immunosorbent Assay; HBsAg: Hepatitis B Surface Antigen; HBV: Hepatitis B virus; SPSS: Statistical Package of Social Science; WHO: World Health Organization

Introduction

Hepatitis B virus (HBV) infection in pregnancy has greater health consequences for the mother and her child when transmitted prenatally or at/after birth. In mothers, it can cause several abnormalities including

hepatitis flare, gestational diabetes and antenatal hemorrhage in addition to increased morbidity and mortality due to advanced infection or cirrhosis [1,2]. Poor birth outcomes include miscarriage, preterm birth, acute and chronic liver diseases and associated death [1,3]. Vertical transmission of HBV from mother to child during infancy and early childhood accounts for almost half of all transmissions of chronic HBV infections [4].

The prevalence of HBV infection among pregnant women varies greatly across sub-Saharan African (SSA) countries, ranging from 2% in Egypt to 26% in southern Sudan [5-11]. Similar geographical variation has been seen in Ethiopia, ranging from 2% in Wollega (in western Ethiopia) to 8% in Dire Dawa (in eastern Ethiopia [12-17]. Studies conducted in the southern part of Ethiopia reported prevalences of 4% in Dawuro and Abrbamech [16,18] and 7% in Yirgalem [19].

Cultural and behavioral factors as well as conditions related to medical care have been associated with HBV infection in pregnant women in SSA. For example, cultural practices such as tattooing, genital mutilation, and nose and ear piercing have frequently been reported to be linked with HBV infection [13-15]. Many of these practices have also been identified as HBV risk factors in Ethiopia, which also includes area-specific traditional practices such as scarifications [12,20].

Risky sexual behavior has been strongly associated with HBV infection and studies show that pregnant women with multiple sexual partners have a much greater risk (up to seven-fold) for HBV infection compared to those with a single partner [13,16,19,21-23]. The risk increases further in women with a history of sexually transmitted infection (STI), who have been reported to have more than ten times the likelihood of HBV infection relative to women without an STI history [24]. Other HBV risk factors have been identified in relation to medical care accessed by women. While a history of hospitalization in general has been associated with HBV infection [5], specific medical practices such as dental extraction, blood transfusion, medical abortion and other surgical procedures are associated with higher risk of HBV infection [8,13-15,18,24,25]. A related risk factor is intimate contact with a person with HBV infection [21,22].

The reviewed literature shows a significant variation in the prevalence of HBV infection in pregnant women in Ethiopia, possibly emanating from difference in a range of contextual factors. Establishing evidence of such factors in this population group, which is known to be a major reservoir of infection, will facilitate prevention efforts in this jurisdiction and, overall, contribute to achieving the World Health Organization (WHO) goal of eliminating viral hepatitis as a public health problem by 2030 [26]. Moreover, given limited access to effective treatment for an advanced HBV infection and associated complications in Ethiopia, paying attention

to prevention aspects is of paramount importance to combat both horizontal and vertical transmissions in the future [27,28].

Methods

Study setting and design

We conducted a cross-sectional study from August to September 2022 at four public health facilities in Hosanna Town, Central Ethiopia Region. Hosanna Town is the largest town in the region and is geographically located in Hadiya Zone, currently serving as both the regional and zonal capital. The participating health facilities included a comprehensive specialized hospital and three health centers. According to data obtained from the health facilities, there were 1383 pregnant women attending antenatal care (ANC) within two months prior to the study commencement [29].

Sample size determination and sampling technique

We estimated the minimum sample size required for the study using a single population proportion formula [30]. We considered the following assumptions to calculate the sample size: 95% confidence level ($Z_{\alpha/2} = 1.96$), 2% margin of error and prevalence of HBV infection among pregnant women of 4.3%, estimated in a previous study conducted in Arbaminch, Southern Ethiopia [18]. Assuming a 10% non-response rate, at least 435 pregnant women were required for this study.

The sample size was then proportionally distributed to the health facilities based on the total number of pregnant women attended the ANC clinics two months prior to the study commencement (equivalent to the study period). We systematically sampled women to participate in the study from those visiting the clinics irrespective of the stage of pregnancy. We determined the interval at which women would be systematically selected by dividing the number of women attending each ANC clinic during the study period by the allocated sample size. The first woman was selected through a simple random technique using a random number table. We excluded women who were unable to provide the required information or informed consent due to severe medical conditions (such as serious diagnosed mental conditions or complications of pregnancy) as confirmed by ANC providers.

Data collection

We collected risk factor data using an interviewer-administered questionnaire constructed with concepts adapted from relevant literature and in consultation with experts in the field. The questionnaire captured information related to the women's socio-demographic and pregnancy related characteristics, potential cultural and behavioural risk factors for HBV infection and factors linked with medical procedures that the women sought. The questionnaire was initially prepared in English and then translated to Amharic (the local language) for

Table 1: Socio-demographic characteristics of pregnant women participated in Hepatitis B virus infection study in Hossana Town (N = 416).

	Variable	Frequency (n)	Percent (%)
Age in years	18-22	91	21.9
	23-27	153	36.8
	28-32	122	29.3
	≥ 33	50	12.0
Marital status	Single	10	2.5
	Married	406	97.5
Residence	Urban	281	67.5
	Rural	135	32.5
Education completed	No formal education	37	5.9
	Primary education	192	46.2
	Secondary education	81	19.5
	College and above	106	25.5
Occupation	Unpaid domestic duties	232	55.8
	Government employee	66	15.9
	Merchant	66	15.9
	Daily laborer	14	3.3
	Student	38	9.1

interviewing, and pretested among 5% of the target population at a health facility that was not included in the actual study. The interviews were undertaken by four midwives who received training in the purpose of the study, methods of participant recruitment and the interviewing technique, and the principal investigator provided regular supervisory support for the data collectors.

Experienced phlebotomists collected approximately 2 mL of venous blood from the participants following the interview to determine their HBV surface antigen (HBsAg) sero-status. The blood sample was processed according to the standard operating procedures. Briefly, serum was separated from red blood cells and stored at -20 °C prior to assay. Then, it was tested for HBsAg using an enzyme-linked immunosorbent assay (ELISA) procedure [31].

Data analysis

Data were checked for completeness and consistency and digitized using Epi-data version 4.6 software prior to being exported to SPSS version 25 [32] for analysis. Participant characteristics that included socio-demographic, cultural and behavioral practices, and medical care related factors were described using means, ranges, frequencies and percentages as appropriate. We performed a binary logistic regression to identify potential factors associated with HBV infection. Variables associated with P values less than 0.25 were fitted into a multivariable logistic regression model. Model fitness was checked using the Hosmer and Lemeshow χ^2 goodness-of-fit test ($P = 0.82$) [33]. Variables with P value less than 0.05 were considered

to have a statistically significant association with HBV infection and are reported with 95% confidence intervals.

Results

Socio-demographic characteristics

Of 435 pregnant women approached, 416 gave consent to participate in the study. The participants had a mean age of approximately 27 years (ranging from 18 to 39 years), with most (about 37%) being within the age range of 23-27 years. Almost all (98%) of the women were married and most (68%) were urban residents. More than half (56%) were employed in unpaid domestic duties, followed by merchants and government employees (16% both). While most women (46%) had attended primary education, only 26% had completed tertiary level education (see Table 1).

Cultural and behavioral practices

While ear piercing was a common cultural practice (71%) among the participants, 39% also reported a history of tattooing. About 9% reported sharing sharp paraphernalia and 4% reported having been married more than once (see Table 2).

Clinical factors

A third (33%) of women reported a history of sexually transmitted infections (STIs) and 4% reported having intimate contact with an HBV infected person. In terms of medical procedures, 21% of participants ever underwent an abortion and 12% reported having a history of any surgical procedure. Around 8% reported having experienced a home delivery (see Table 3).

Table 2: Behavioral and cultural practices related to Hepatitis B virus (HBV) infection among pregnant women in Hossana Town (N = 416).

Variable		Frequency (n)	Percent (%)
Tattooing	Yes	163	39.2
	No	153	60.8
Ear piercing	Yes	295	70.9
	No	121	29.1
Nose piercing	Yes	51	12.3
	No	365	87.7
Sharing sharp paraphernalia	Yes	37	8.9
	No	379	91.1
Married > 1	Yes	15	3.6
	No	401	96.4
Husband having > 1 wives	Yes	53	12.7
	No	363	87.3

Table 3: Clinical factors related to Hepatitis B virus (HBV) infection among pregnant women in Hossana Town (N = 416).

Variable		Frequency (n)	Percent (%)
Experience of dental procedure	Yes	20	4.8
	No	396	95.2
History of surgical procedure	Yes	50	12.0
	No	366	88.0
Experience of abortion	Yes	89	21.4
	No	327	78.6
History of blood transfusion	Yes	11	2.6
	No	405	97.4
Experience of home delivery	Yes	33	7.9
	No	383	92.1
History of sexually transmitted diseases	Yes	136	32.7
	No	280	67.3
Contact with HBV infected person	Yes	17	4.1
	No	399	95.9

HBV infection prevalence and associated factors

The overall prevalence of HBV infection among the women was 8% (95% CI: 5.5-10.8%). Among the risk factors assessed, having intimate contact with HBV-infected person, previous tattoos and a history of STIs were associated with HBV infection (see Table 4). The odds of having intimate contact with an HBV-infected person were around six times higher among women with HBV-infection (AOR: 5.77; 95% CI: 1.47-22.5). Relative to those who were HBsAg negative, HBV-infected participants, had almost four times higher likelihood of reporting tattooing (AOR 3.79; 95% CI: 1.53-9.37) and were almost three times more likely to report an STI history (AOR: 2.87; 95% CI: 1.26-6.53).

Discussion

This study assessed the prevalence of HBV infection and associated risk factors among pregnant women in one of the largest towns in Central Ethiopia Region. The study revealed that more than 8% of the participants

were infected with HBV, which is among the highest prevalences reported in similar populations in SSA [9,18] and Ethiopia [19,21,24]. Over and above the direct health consequences for mothers and infants, this has serious public health and clinical implications, given mother-to-child transmission is a major mode of chronic HBV transmission. The finding underscores the importance of infant and childhood vaccination in addition to efforts to prevent transmission through active screening combined with treatment education [34,35].

Our study identified three important risk factors for HBV infection among pregnant women. Having intimate contact with an HBV-infected person was strongly associated with acquiring HBV infection, with those infected six times more likely to report such contact than women without HBV infection. This finding is not surprising given that HBV is primarily transmitted via exposure to infected blood and body fluids [36]. However, the strength of the association in this study

Table 4: Factors associated with Hepatitis B virus (HBV) infection among pregnant women in Hossana Town (N = 416).

Variables	HBV status		COR (95% CI)	AOR (95% CI)	P value	
	+Ve	-Ve				
Age in years	18-22	3	88	4.77 (1.17-19.3)	2.71 (0.55-13.2)	0.21
	23-27	14	139	1.61 (0.61-4.26)	0.78 (0.25-2.37)	
	28-32	10	112	1.82 (0.65-5.09)	1.25 (0.38-4.09)	
	≥ 33	7	43	1	1	
History of blood transfusion	No	31	374	1	1	0.19
	Yes	3	8	4.52 (1.14-17.9)	3.20 (0.55-18.4)	
Experience of dental procedure	No	30	366	1	1	0.13
	Yes	4	16	3.05 (0.95-9.70)	2.91(0.70-11.9)	
Experience of home delivery	No	27	356	1	1	0.06
	Yes	7	26	3.55 (1.41-8.92)	2.79 (0.94-8.22)	
History of STI	No	13	267	1	1	0.01*
	Yes	21	115	3.75 (1.81-7.74)	2.87 (1.26-6.53)	
Contact with HBV infected person	No	30	368	1	1	0.01*
	Yes	4	14	3.50 (1.08-11.3)	5.77 (1.47-22.5)	
Experience of medical abortion	No	20	307	1	1	0.12
	Yes	14	75	2.86 (1.38-5.93)	1.98 (0.82-4.75)	
Tattooing	No	8	245	1	1	0.00*
	Yes	26	137	5.81 (2.56-13.1)	3.79 (1.53-9.37)	
Nose piercing	No	22	343	1	1	0.05
	Yes	12	39	4.79 (2.20-10.4)	2.55 (0.99-6.55)	
Married > 1	No	30	371	1	1	0.44
	Yes	4	11	4.49 (1.35-14.9)	1.73 (0.42-7.02)	

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; HBV status: Hepatitis B virus infection status; +Ve: Positive; -Ve: Negative; *Stands for a significant association

suggests the importance of the transmission mode in the study context, especially amongst family members. Intimate contact with an infected person is one of the main transmission modes among women in Ethiopia as is suggested by previous studies, especially for women with primary care responsibilities for HBV-infected persons [21,22]. This suggests the need for raising awareness about precautions that must be taken when taking care of HBV patients, which could be achieved through the integration of educational interventions into health care and reinforced during routine antenatal care.

Tattooing also emerged as an important risk factor in our study, with HBV-infected participants four times more likely to have ever practiced tattooing or had a tattoo applied. This suggests the existence of sharing infected tattooing material among the women. Tattoos are well-documented risk factors for HBV infection and tattooing is a common cultural practice among women in northern Ethiopia [12,20,37]. The current finding among pregnant women may provide preliminary evidence for a growing trend of tattooing in the central and southern part of the country, for which further research is warranted to gain in-depth understanding to inform effective intervention strategies.

Our study also revealed a strong association between history of sexually transmitted infections (STIs) and HBV infection. The presence of STIs is an indicator for unprotected sex and, among married women, suggests this has been with more than one sexual partner either by the women or their partner. STI history has emerged as important means of HBV transmission among pregnant women in Ethiopia [16,18,19,21-23]. Having multiple sexual partners did not appear to be common among women in this study (might partly be attributed to social sensitivity of the topic), but more than 12% of the participants did report having partners who had more than one known sexual partner. The sexual behavior of both the women and their partners needs to be comprehensively investigated to clearly identify the exact sources of both STIs and HBV infection. Significantly high prevalences of HBV infection have been reported in settings where women also had high STI prevalence elsewhere in Ethiopia [24].

Our study is subject to some limitations. Although the factors identified are well-known risk factors for HBV infection, the cross-sectional nature of the study limits its ability to establish cause-effect relationships in the study population. Despite the fact that there is

a high possibility that the characteristics of the women reflect those in the community given the possible interconnection between cultural practices and individual behaviours in the study locality, the current findings cannot directly be generalized to the women who did not access the participating health facilities. The study relied on participants' responses for risk factor data which could be affected by social desirability and recall bias, and might lead to over or underestimation of the true values. Nonetheless, our findings reflect what is known about HBV risk factors elsewhere which provides greater confidence of the relevance of our findings to antenatal populations in Ethiopia and SSA more broadly.

Conclusions

This study identified a higher prevalence of HBV infection among pregnant women compared to most previous reports in SSA and Ethiopia. Intimate contact with HBV infected person, higher odds of having unsafe sex (as indicated by the history of STIs) and the practice of tattooing (related to sharing infected material) were associated with HBV infection. As all the factors are highly likely to be linked to low awareness of HBV transmission means, there is a need to integrate educational efforts into routine health and maternal care.

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Authors' Contributions

NL conceived the research idea; analysed and interpreted data; drafted the manuscript. TYH, ERM, TGF and DE participated in the subsequent revisions of the manuscript. All authors read and approved the final manuscript.

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