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## ORIGINAL ARTICLE

### SEROPREVALENCE OF HEPATITIS B VIRUS SURFACE ANTIGEN, ANTI-HEPATITIS C VIRUS ANTIBODY AND THEIR ASSOCIATED FACTORS AMONG MOTHERS LIVING IN HARAR, EASTERN ETHIOPIA

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#### ABSTRACT

**Background:** Hepatitis B virus (HBV) and Hepatitis C Virus (HCV) infections are major causes of acute and chronic liver disease and infection by these viruses during pregnancy is associated with maternal, fetal and neonatal health complications. Understanding the epidemiology of these viruses could be valuable to take appropriate preventive measures.

**Objective:** This study aims to determine the seroprevalence and associated factors of HBV and HCV infection among mothers living in Harar, Ethiopia.

**Materials and Methods:** A cross-sectional study was conducted among 461 mothers living in Harar, Eastern Ethiopia from March 1 – May 30, 2017. The systematic random sampling method was used to select the study participants. Sociodemographic information was collected through face-to-face interviews using pre-tested structured questionnaires. Five millilitres of venous blood was collected from each study subject and HBsAg and anti-HCV levels in sera were tested using a sandwich third generation Enzyme-Linked Immunosorbent Assay (ELISA). Data was analysed by using Statistical Package for Social Sciences (SPSS) version 20.

**Result:** The seroprevalence rates for HBV and HCV infection were 5.9% and 1.1%, respectively. None of the mothers were co-infected with HBV and HCV. Among the potential risk factors, previous history of abortion (AOR =3.7 95% CI 1.4-9.6) and multiple sexual exposures (AOR =10.6, 95% CI 4.0-27.9) were significant predictors of HBV infection.

**Conclusion:** This study determined that the prevalence of HBV and HCV infection among mothers was 5.9% and 1.1% respectively. History of abortion and history of multiple sexual partners were significantly associated with HBV infection. Health education programs on the mode of HBV and HCV transmission, high-risk behaviours and methods of preventions are recommended to raise awareness and reduce the spread of infection.

**Keywords:** Sero-prevalence, Hepatitis B virus, Hepatitis C virus, Risk factors, Harar

#### INTRODUCTION

Viral hepatitis (mainly types A, B, C, D, and E) are major causes of morbidity and mortality worldwide, accounting for more than one million deaths annually (1). Of these five, Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) are the most common, and HBV especially may lead to neonatal hepatitis, which may lead to an impaired mental and physical health of the child later in life (2).

HBV and HCV infections cause considerable morbidity and mortality (3). About 10% of adult patients with HBV develop chronic infection and about 15-40% of those chronically infected patients develop liver cirrhosis and hepatocellular carcinoma (HCC) (4). On the

hand, about 75 - 85% of patients with HCV develop a chronic infection while about 10 - 15% develop liver cirrhosis (5).

One way to control and reduce the burden caused by HBV infections on mothers is through implementing vaccination programs for HBV (3, 6). Assessing associated factors of HBV and HCV infections are also important to know the source of infection and thereby limiting the spread of the pathogen (6).

A study recommended that mothers, particularly during their pregnancy, should be screened for HBV, as this offers an opportunity to prevent another generation from being chronically infected by the virus (7). Immunization for HBV is estimated to avert between 2 and 3 million deaths globally each

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Early diagnosis and treatment of HBV and HCV infections in mothers are important to combat transmission to children, which can lead to the rapid spread of these diseases in the community (9, 10). Studies on seroepidemiology of HBV and HCV prevalence in Ethiopia have been previously done among different risk population groups including pregnant women (2, 10). However, there is very limited data about the prevalence of HBV and HCV infections among the general population like healthy mothers or women in Harar town and its neighbouring areas. Therefore this study attempted to determine seroprevalence of HBV and HCV and their associated risk factors among mothers living in Harar town, Eastern Ethiopia

## MATERIALS AND METHODS

**Study area and period:** The study was conducted from March 1, 2017 to May 30, 2017 in Harar town, Harari regional state, eastern Ethiopia. Harar is located 550 km east of Addis Ababa, the capital city of Ethiopia. The total number of women in the child-bearing age group and pregnant women in the region were about 51,533 (26.1%) and 6,713 (3.4%) respectively (11).

**Study population and sampling technique:** A community-based quantitative cross-sectional study design was used. Four woredas were chosen by lottery from the total of six woredas found in Harar. One kebele was selected randomly from each four woredas. A total of 461 mothers were recruited from these kebeles using systematic sampling technique. The first household for recruitment of mothers was selected by the lottery method. Then, every kth house with a mother was included in the study.

**Data collection:** Demographic and clinical data of participants were collected through a face-to-face interview conducted by nurses, who used a pre-tested and structured questionnaire.

**Blood sample collection, transport, and processing:** Five millilitres of venous blood was collected by a trained medical laboratory technologist from each study participant. The blood was allowed to clot naturally and then serum was separated and stored at -20°C in the laboratory at the College of Health and Medical Sciences, Haramaya University (HUCHMS). Serum samples were transported to Dire Dawa Regional Blood Bank for ELISA experiments. All samples were tested for hepatitis using a sandwich third generation Enzyme-Linked Immunosorbent Assay (ELISA) for HBsAg and anti-HCV from each sample (Bio-Rad ELISA kits.)

Standardized operating procedures were strictly followed during blood sample collection, storage, and analytical processes. Assay quality was assured by running a positive and negative control with each test.

**Data analysis:** The data was analysed using SPSS version 20. Descriptive analyses were used to determine the sociodemographic and clinical characteristics of study participants and the prevalence of HBV and HCV infections. Prevalence of HBV and HCV infection was determined by dividing the number of infected women with the total number of women examined for this study. Association between possible risk factors and prevalence of HBV infection were determined using bivariate analysis and those variables with a p-value < 0.3 in bivariate analysis were analysed by multivariate logistic regression analysis. Adjusted odds ratio (AOR) with 95% confidence interval were determined and those with a p-value of < 0.05 in multivariate analysis were considered statistically significant.

**Ethical consideration:** Ethical clearance was obtained from the AHRI/ALERT Research Ethics Review Committee and the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University College of Health and Medical Science. Written informed consent was sought from all study participants.

## RESULTS

**Sociodemographic, behavioural and clinical characteristics:** A total of 461 mothers were recruited to this study. The age of study participants ranged from 24 to 50 years, with a mean age of 30.2 (SD ± 5.2). The majority of the mothers (39.9%) were between the ages of 24 to 29 years and married (88.1%) (Table 1).

**Seroprevalence of HBsAg and anti HCV:** In this study, the overall prevalence of HBsAg and anti-HCV was 5.9 % (27/461) (95% CI: 4–8%) and 1.1% (5/461) (95% CI: 0–2%), respectively. Mothers who were single (10.3%), who were not able to read or write (8.2%), who were between the ages of 20-24 years (7.5%), and who were day labourers (21.6%) had relatively higher prevalence of HBV, however it was not statistically significant (Table 2). HBV and HCV co-infection were not observed in this study.

Table 1: Sociodemographic characteristics of mothers in Harar, Harari regional state, eastern Ethiopia 2017.

Variables		Frequency n=461 (no, %)
<b>Age groups</b>	24-29	237(51.4)
	30-34	152(33)
	35 and older	72(15.6)
<b>Educational back-ground</b>	Unable to read and write	85(18.4)
	Elementary school (1-8)	188(40.8)
	Secondary school (9-12)	82(17.8)
	College/university level and above	106(23)
<b>Marital status</b>	Married	406(88.1)
	Single	29(6.3)
	Divorced	10(2.2)
	Widowed	16(3.5)
<b>Occupation</b>	Employee	118(25.6)
	Day laborer	74(16.1)
	House wife	214(46.4)
	Student	42(9.1)
	Merchant	13(2.8)

Table 2: Prevalence and associated factors of HBV in relation to sociodemographic characteristics among mothers in Harar, Harari regional state, eastern Ethiopia, 2017(N=461).

Variables		HBsAg status	COR (95% CI)		P value	
		Total n (%)	Pos n (%)	Neg n (%)		
<b>Age Group</b>	24-29	237(51.4)	16(6.7)	221(93.3)	1.7(0.5-5.9)	.43
	30-34	152(33)	8(5.3)	144 (94.7)	1.3(0.3-4.9)	.72
<b>Educational background</b>	35 and older	72(15.6)	3(4.2)	69 (95.8)	1	
	Unable to read and write	85(18.4)	7(8.2)	78(91.8)	1.8(0.1-5.9)	.33
	Elementary school (1-8)	188(40.8)	11(5.8)	177(94.2)	1.3(0.4-3.7)	.68
	Secondary school (9-12)	82(17.8)	4(4.9)	78(95.1)	1.0(0.3-3.9)	.96
	College/ university level and above	106(23)	5(4.7)	101(95.3)	1	
<b>Marital status</b>	Married	406(88.1)	22(5.4)	384(94.6)	1	
	Single	29(6.3)	3(10.3)	26(89.7)	2.0(0.6-7.2)	.28
	Divorced	10(2.2)	1(10)	9(90)	1.9(0.2-16.0)	.54
	Widowed	16(3.5)	1(6.2)	15(93.8)	1.2(0.2-9.2)	.89
<b>Occupation</b>	Employee	118(25.6)	4(3.4)	112(96.6)	0.7(0.1-3.9)	.93
	Day laborer	74(16.1)	16(21.6)	58(78.4)	5.5(1.2-25.3)	.28
	House wife	214(46.4)	5(2.3)	209(97.3)	.5(0.1-2.6)	.92
	Merchant	13(2.8)	-	13(100)		
	Student	42(9.1)	2(4.8)	40(95.2)	1	

COR crude odd ratio, 1 = reference value

**Factors associated with HBV infections:** Bivariate analysis revealed an association between HBV infection and history of hospital admission, history of surgical procedures, history of having multiple sexual partners, and history of abortion (Table 3).

Multivariate analysis was done on factors that showed association with HBV infection from bivariate analysis. This revealed that mothers who had a history of abortion were 4 times more likely to acquire HBV infection than mothers who had no history of abortion (AOR =3.7; 95% CI: 1.4-9.5). Similarly, mothers with a history of multiple sexual partners were 11 times more likely to acquire HBV infection than mothers who do not have a history of multiple sexual partners (AOR= (10.6; 95% CI: 4 .0-27.9) (Table 4).

**Factors associated with HCV infections:** Socio-demographic and other factors associated with HCV infection were assessed using Fisher's exact test. Higher HCV infection prevalence was observed in mothers between the ages of 30-34 years (2%) and mothers that were students (2.4%) (Table5).

Of all behavioural and clinical factors evaluated with Fisher's exact test, none of them were significantly associated with the prevalence of HCV (Table 6).

Table 3: Prevalence of HBV with other associated factors among mothers in Harar, Harari regional state, eastern Ethiopia, 2017 (N=461).

Variable	HBsAg status			COR 95% CI)	P value	
	Total n (%)	Pos n (%)	Neg n (%)			
<b>Home delivery</b>	No	400(86.8)	23(7)	377(93)	1	0.80
	Yes	61(13.2)	4(6.6)	57(93.4)	1.2(.4-3.5)	
<b>Status of HIV</b>	Neg	438(95)	25(7.1)	413(92.9)	1	0.56
	Pos	23(5)	2(8.7)	21(91.3)	1.6(0.4-7.1)	
<b>History of Surgical procedure</b>	No	415(90)	21(7)	394(93)	1	0.04
	Yes	46(10)	6(6.7)	40(93.3)	2.8(1.1-7.4)	
<b>History of hospital admission</b>	No	353(76.6)	17(7.1)	336(92.9)	1	0.09
	Yes	108(23.4)	10(9.3)	98(90.7)	2.0(0.9-4.6)	
<b>History of blood transfusion</b>	No	450(97.6)	27(6)	423(94)	1	0.49
	Yes	11(2.4)	-	11(100)	1.4(0.5-3.9)	
<b>History of tattooing</b>	No	396(85.9)	22(5.9)	374(94.1)	1	0.00
	Yes	65(14.1)	5(7.2)	60(88.4)	10.5(4.6-23.7)	
<b>History of multiple sexual partners</b>	No	392(85)	11(2.8)	376(97.2)	1	0.004
	Yes	69(15)	16(23.2)	58(76.8)	5.2(2.4-11.5)	
<b>History of Abortion</b>	No	362(78.5)	12(3.3)	347(96.7)	1	0.004
	Yes	99(21.5)	15(15.1)	87(84.9)	5.2(2.4-11.5)	

COR crude odd ratio, 1 = reference value

Table 4: Factors associated with HBV infection among mothers in Harar, Harari regional state, eastern Ethiopia, 2017 (N=461).

Variables		AOR (95% CI)	P value
<b>Marital status</b>	Single	0.8(0.13-5.4)	0.86
<b>Occupation</b>	Day laborer	3.9(0.7-20.5)	0.11
<b>History of Surgical procedure</b>	No		
	Yes	1.7(0.4-7.4)	0.50
<b>History of hospital admission</b>	No		
	Yes	1.5(0.5-4.8)	0.51
<b>History of multiple sexual partners</b>	No		
	Yes	10.6(4.0-27.9)	0.001
<b>History of Abortion</b>	No		
	Yes	3.7(1.4-9.6)	0.008

AOR adjusted odd ratio

Table 5: Prevalence of HCV in relation to socio demographic characteristics among mothers in Harar, Harari regional state, eastern Ethiopia, 2017 (N=461).

Variables	Anti HCV status			P value*	
	Total n (%)	Pos n (%)	Neg n (%)		
<b>Age Group</b>	24-29	237(51.4)	1(0.4)	236(99.6)	.32
	30-34	152(33)	3(2)	149(98)	
	35 and older	72(15.6)	1(1.4)	71(98.6)	
<b>Educational background</b>	Unable to read and write	85(18.4)	1(1.2)	84(98.8)	.81
	Elementary(1-8)	190(41.2)	2(1)	188(99)	
	Secondary(9-12)	82(17.8)		82(100%)	
	College/ university level and above	104(22.6)	2(1.9)	102(98.1)	
<b>Marital status</b>	Married	406(88.1)	4(1)	402(99)	.28
	Single	29(6.3)		29(100%)	
	Divorced	10(2.2)		10(100%)	
	Widowed	16(3.5)	1(6.2)	16(93.8)	
<b>Occupation</b>	Employee	118(25.6)	-		.49
	Day laborer	74(16.1)	1(1.3)	73(98.7)	
	House wife	214(46.4)	3(1.4)	211(98.6)	
	Student	42(9.1)	1(2.4)	41(97.6%)	
	Merchant	13(2.8)	-	13(100)	

\* Fisher's exact test

Table 6: Possible risk factors for HCV infection among mothers in Harar, Harari regional state, eastern Ethiopia, 2017 (N=461).

Variable		HCV status			P value*
		Total n (%)	Pos n (%)	Neg n (%)	
Home delivery	No	400(86.8)	4(1)	396(99)	0.51
	Yes	61(13.2)	1(1.6)	60(98.4)	
Status of HIV	Neg	438(95)	5(1.1)	433(98.9)	
	Pos	23(5)	-	23(100)	
History of Surgical procedure	No	415(90)	5(1.2)	410(98.8)	
	Yes	46(10)	-	46(100)	
History of hospital admission	No	353(76.6)	3(0.8)	351(99.2)	0.33
	Yes	108(23.4)	2(1.9)	105(98.1)	
History of blood transfusion	No	445(98.8)	5(1.2)	450(97.6)	
	Yes	11(100)		11(2.4)	
History of tattooing	No	396(85.9)	3(0.8)	393(99.2)	0.15
	Yes	65(14.1)	2(3)	67(97)	
History of multiple sexual partners	No	392(85)	4(1)	392(99)	0.56
	Yes	69(15)	1(1.5)	64(98.5)	
History of Abortion	No	362(78.5)	2(0.5)	360(99.5)	0.35
	Yes	99(21.5)	3(3)	96(97)	

\* Fisher's exact test

## DISCUSSION

The seroprevalence of hepatitis B and hepatitis C infections in this study were 5.9% and 1.1%, respectively. The prevalence of HBV and HCV infections found in the current study can be graded as intermediate and low prevalence, respectively according to WHO criteria (2, 13).

The prevalence of HBV infection observed in this study was similar to HBV prevalence observed in the report from Kabinda et al. (5.9%) (13). However, HBV prevalence observed in this study was higher than HBV prevalence levels reported in studies conducted in Kenya (3.8%)(17), Nigeria (3.9%) (18), Saudi Arabia (4.1%) (19), Iran (1.2%) (20), and Lao People's Democratic Republic (2.9%)(21), and in different parts of Ethiopia: 4.9% in Dessie (2), 3.7% in Jimma (14), 3.0% in Addis Ababa (15), 4.3% in Arba Minch (16), and 4.4% in Bahir Dar (10).

These differences might be due to different study designs and experimental methods. For example, some of the studies used the rapid test strip while we used the ELISA.

On the other hand, HBV prevalence observed in this study was lower than HBV prevalence reported in studies conducted in Addis Ababa, Ethiopia (7%) (22), Mekelle, Ethiopia (8.1%) (23), Deder, Ethiopia (6.7%) (24), China 9.5% (25), and Pakistan (10.5%) (26). These variations might be due to differences in sociodemographic characteristics of the study subjects, differences in study design, or differences in sample size.

Most of the studies mentioned above were institution-based studies on a larger number of pregnant women, while ours was a community-based study on a smaller number of non-pregnant women. In this study, we observed a 1.1% HCV infection prevalence.

This is higher than HCV infection prevalence levels reported in studies conducted in Bahir Dar, Ethiopia (0.6%) (27) and Malawi (0.71%) (28). On the other hand, HCV infection prevalence is lower than what was reported in studies conducted in Kuwait (5%) (29), Nigeria (3.6%, 3.9%) (30, 31), Democratic Republic of Congo (4.1%) (13) and Central Sudan (1.3%) (28). These variations might be due to differences in sample size and sociodemographic characteristics of study participants. We used a much smaller sample size compared to the studies mentioned above and we also enrolled non-pregnant women to our study while they enrolled pregnant women. There was no HBV and HCV co-infection observed in this study, which is in line with the findings of Seid et al. (2) and Molla et al. (10). However, Ugbebor et al. (30) reported 0.57% HBV and HCV co-infection.

HBV prevalence is significantly higher among mothers with a history of abortion when compared with mothers who with no abortion history. This finding is in line with observation reported in studies conducted in Deder (24), Arba Minch (16), Dessie (2), Kenya (17), and China (25). This could be due to unsafe and unsterile abortion practices.

Women with a history of multiple sexual partners were more likely to acquire HBV infection when compared with women with a history of single sexual partner. Similar associations were reported in Deder (24), Felege Hiwot (10), Mekelle, (23), and Arba Minch (16). It is known that hepatitis B is transmitted through blood, semen and other body fluids, thus, sexually active women have a higher chance of getting the infection especially those who have the history of multiple sexual partners (33).

In this study, the status of HIV infection, history of blood transfusion, history of hospital admission, home delivery and tattooing were not associated with HBV infection. This was consistent with the findings reported in a study conducted in Arba Minch, Ethiopia (16). However, there was a significant association between HBV infection and home delivery reported from a study in Felege Hiwot, Ethiopia (10), HBV infection and history of hospital admission in Saudi Arabia (19) and HBV infection and body tattooing from a study in the Democratic Republic of Congo (13) and China (25).

In this study, the prevalence of HBV and HIV co-infection was 8.7%. This is higher than what was reported in a study done in Mekelle, Ethiopia (3.6%) (23). In contrast, it was lower than what was reported in a study conducted in Dessie (22.6%) (2).

However, this study revealed that there was no significant association between seroprevalence of HBV and HIV status of the women. The reason for this might be due to the presence of a small number of HIV positive women in this study. Age was negatively associated with seropositivity of HBV. Younger women between the ages of 24-29 years (6.7%) had higher HBV seropositivity than older women (>35 years old) (4.2%). This finding is in agreement with results reported in Deder, Ethiopia (8%) (2), Kenya (4.3%) (17) and China (11.4%) (25). The reason behind this could be due to the fact that younger women are more sexually active and are also more likely to have multiple sexual partners. Educational status of participants were also not significantly associated with the risk of HBV infection, however, the highest HBsAg prevalence was among those who could not read or write (8.2%). This result is consistent with the reports by Yohanes et al. (16) but the report by Zhang et al. (25) indicated lower education level was significantly associated with the risk of HBV infection. This could be due to a low level of awareness about the transmission of the infection in those who cannot read or write.

All HCV risk factors considered in this study were not significantly associated with HCV seropositivity, and it is in line with a study from Bahir Dar city, Northwest Ethiopia (27) and Democratic Republic of Congo (13). On the contrary, a study conducted in Kuwait reported that history of abortions, blood transfusion, surgery, and tattooing were associated with HCV infection (29). This might be due to differences in sample size.

### Conclusion

This study determined that the prevalence of HBV and HCV infection among mothers were 5.9% and 1.1% respectively. History of abortion and history of multiple sexual partners were significantly associated with HBV infection. All of the potential assessed factors were not significantly associated with HCV prevalence.

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