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ORIGINAL RESEARCH

Sero-Prevalence of Hepatitis B and Associated Risk Factors among HIV/ ADIS Patients Attending Debark Hospital, Northwest Ethiopia

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Abstract

Hepatitis B is the most critical and prevalent infectious virus leading to human liver inflammation. HIV infection and intravenous drug use are directly related to the prevalence of Hepatitis B in different nations, regions, and populations. The general objective of the present study is to determine the prevalence and associated risk factors of Hepatitis B Virus infection among HIV/ADIS patients attending Debark Hospital, Northwest Ethiopia. A hospital-based cross-sectional study was conducted on 113 volunteer HIV/AIDs patients attending at Debark Hospital from February to June, 2018. The test for Hepatitis B surface antigen (HBsAg) was done using a rapid diagnostic test kit, according to the manufacturer's instructions (One Step HBsAg test, Ameritech-china, Ltd. Seattle, Washington, USA). An interviewer-administered pretested questionnaire was used to collect data on demographic information and other factors associated with HBV infection. Analysis of data was conducted using the SPSS version 20 statistical package. The results were summarized using descriptive statistics and univariate and multivariate logistic regression. The overall prevalence of HBV was 6.2%. The prevalence in females was 6.9%, with males accounting for 4.9%. Rural residence (COR = 6.667, 95CI, 1,06-41.77, P-value=0.025), having multiple sexual partners (COR = 5.365, 95CI = 1.077-26.77, P□value=0.040), having surgical history (COR=8.76,95 CI = 1.77-43.34, P-value=0.001), and having dental procedure (COR = 4.125, 95CI =1.076-22.27, P-value=0.01) were associated with a statistically significant increased risk of HBV infections. The result uses to develop appropriate preventive services, allocate resources decided on priorities and target populations with HIV/ AIDS.

Keywords: Co -infection, Debark Hospital, Hepatitis B virus, Human immunodeficiency virus, Prevalence, Risk factors .

INTRODUCTION

Hepatitis B virus (HBV) is the most critical and prevalent infectious agent leading to human liver inflammation (Thio *et al.,* 2002; Weber *et al.,* 2006). HBV is a DNA virus it replicates in the liver cells and causes acute and chronic liver infections. It is a primary cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma. Hepatitis B virus spread mainly through contaminated blood and blood products, sexual contact, and contaminated needles. Most people are unaware of their infection with viral hepatitis and unknowingly transmit it to healthy people, so it is a silent epidemic due to its highly asymptomatic nature (WHO, 2022).

HBV infection is a serious public health problem that occurs all over the world. For instance, 257 million people were living with chronic hepatitis B infection and estimated 820,000 deaths, mostly from cirrhosis and hepatocellular carcinoma in 2019 (WHO, 2022). Approximately 4.5 million new HBV infections are occurring worldwide each year and a quarter progress of liver disease from these new infections. The WHO Western Pacific Region has the highest prevalence of chronic hepatitis B infection at 111 million people, followed by the WHO African region with 81 million chronic hepatitis B infections (WHO, 2022). Ethiopia is categorized as a country with an endemic viral hepatitis. The overall pooled prevalence of HBV was 6%, and among subgroups, pregnant women and healthcare workers, the prevalence of HBV was 5% for HIV positive patients (Yazie and Tebeje, 2019).

In resource-limited countries, the main transmission routes of HBV infection are vertical and/or perinatal transmission, that is, transmission directly from the mother to an embryo, fetus, or baby during pregnancy or childbirth. Hence, individuals acquire the infection at an early age. Contact with infected blood or body fluids (including semen and saliva) are also a transmission route in developing nations (Sulkowsi, 2008). However, blood and blood products are the main reservoirs for HBV infection, which also share transmission routes with HIV/AIDS (Lacombe and Rockstoh, 2012; Zenebe *et a*l., 2014). HIV /AIDS is a global pandemic. Sub-Saharan Africa, including Ethiopian, remains the region most heavily affected by the virus, accounting for 68% of people living with HIV and 70% of new infections in 2020(WHO,2021). Among the 38.4 million persons living with HIV/AIDS in 2021 an estimated 2.7 million had chronic HBV infection. Liver diseases are a major cause of morbidity and mortality among those living with HIV co-infected with viral hepatitis (WHO, 2021).

Prevalence of hepatitis B has been studied in different parts of Ethiopia (Metaferia *et al.,* 2016: Dagnew *et al.,* 2020: Asemahgn *et al.,* 2020). For instance, the overall sero-prevalence of HBsAg in pregnant women attending an antenatal clinic in three tertiary hospitals in the Amhara National Regional State was 4.3% (Dagnew *et al.,* 2020). Higher sero-prevalence of HBsAg (7.4%) was reported among pregnant women in south Ethiopia (Metaferia *et al.,* 2020). Similarly, the sero prevalence of HBsAg was (8%) for the study participants who booked for surgical procedures at Felegehiwot referral hospital in Bahardar (Asemahgn, 2020).

The distributions of the viruses and risk factors for their transmission are not addressed well in varying community groups like HIV-infected patients. Many researchers have investigated the prevalence rates of HBV infections in various groups (health care workers, blood donors, medical waste handlers, and others). However, studies in Ethiopia on single and co-infection with HBV among people living with HIV are limited to a few cases.

MATERIALS AND METHODS

Study setting

The study was conducted at Debark Hospital, located 830 km North West of Addis Ababa in the North Gondar Zone of the Amhara regional state. Debark Hospital serves the people of the rural and urban areas of Debark district and the nearby districts such as Dabat, Janamora, and Adiarkay.

Study Design, Period, and Sample Size

A Hospital-based cross-sectional study was conducted in Debark Hospital from February to June 2018.Because the number of HIV patients was small in Debark hospital; the study included all volunteer participants attending Debark hospital during the study period.

Data Collection and Processing

A structured questionnaire was used to obtain the demographic data and the risk factors associated with HBV infection like sex, age, residence, occupation, religion, maternal status, history of sexually transmitted diseases, and abortion. The questionnaire was administered to all the participants enrolled in the study before specimen collection.

Blood Sample Collection and HBsAg test procedure

Blood samples for the screening of HBV were collected from HIV/ADIS patients by professional laboratory personnel. Five ml of blood sample was collected from every participant using a red top vacutainer tube. After clotting, serum was separated by centrifugation at 3 000 r/min for 10 min for HBsAg. The sera were tested for HBsAg using the commercially available test kit according to the manufacturer's instruction (One step HBsAg test, Ameritech-china, Ltd. Seattle, Washington, USA) (Kruman *et al*., 1999).

Quality control

To assure data quality, all the specimens were collected according to a standard procedure for specimen collection. The quality of test results was maintained using the internal quality control of the test kits and by using known negative and positive controls. The standard operating procedures were strictly followed. Known positive and negative samples were used in each test procedure for HBV testing, and the kit has an internal control system showing a red band at the control region.

Data analysis and interpretation

Data from the laboratory and questionnaires were analyzed using SPSS version 20 software. The results were summarized using descriptive statistics and logistic regression. Association and strength of association between the prevalence of HBV and socio-demographic characteristics & other risk factors were assessed using bivariate and multivariate logistic regressions, respectively. P-values <0.05 were considered statistically significant.

Ethical Considerations

The researchers obtained an Ethical approval letter from the College of Natural and Computational Sciences ethical committee, University of Gondar. The participants gave informed consent after a brief explanation of the purpose and importance of the study. The results were kept confidential. Finally, the positive results were communicated to the attending physician.

RESULTS

Socio-demographic characteristics

Table 1 shows the demographic characteristics of the participants. One hundred thirteen patients [72 (63.7%) females and 41 (36.3%) males] were included in the study. The age of the participants ranged from 15 to 64 years. The mean age was 39.6 (±2.98) years. Most of the participants were in the age range 25 to 34

[27 (32.7%)], and 80 (70.8%) of them were urban residents.

Table 1. Socio-demographic characteristics of study participants at Debark Hospital, Northwest Ethiopia

Variables	Category	Frequency	Percent
Sex	Male	41.0	36.3
	Female	72.0	63.7
	Total	113	100.0
Age	15-24	6	5.3
	25-34	37	32.7
	35-44	29	25.7
	45-54	26	23.0
	55-64	15	13.3
	Total	113	100.0
Residence	Rural	33	29.2
	Urban	80	70.8
	Total	113	100.0

Prevalence of HBsAg in Debark Hospital

The overall sero-prevalence of HBsAg in HIV/ AIDs patient in the present study was 6.2%. Two (4.9%) of the males and 5 (6.9 %) of the females were HBsAg positive. The statistically insignificant higher prevalence of HBsAg was observed in age category of 35-44 (n=4; 13.8%) (Table 2).

Risk factors of HBV infections

Bivariate and multivariate analysis of the different risk factors associated with HBV infection is presented in Table 3. In the bivariate analysis; rural residence, having tattooing, habit of drinking alcohol, having multiple sexual partners, having dental procedure, and having surgical history were significantly associated with HBV infection. But in multivariate analysis all variables were not significantly associated with HBV infection. Patients in rural areas had an 8.6-fold higher risk of HBV infection than those in urban areas (AOR = 6.85, 95% CI: 1.378-37.959, P = 0.025). Study participants who had more than one sexual partner were 5.3 times more infected than those who had only one sexual partner (COR = 5.365, 95% CI: 1.077 -26.770, P = 0.040). Patients with a history of dental procedures were 4.1 times more likely to have HBV infection than those without (AOR = 4.125, 95% CI: 0.764-22.27, P = 0.010). Similarly, study participants that had surgical history (COR = 8.762, 95CI (1.771-43.357, P = 0.008) were 8.7 times more infected than those without surgical history (Table 3).

Table 2 Age and sex Distribution of HBsAg at Debark Hospital, Northwest Ethiopia, between February to June, 2018

Variable	Category	Total tested n (%)	Positives n (%)	Negatives n (%)	X^2-Values	P. Value
Sex	Male	41	2(4.9)	39(95.1)	0.192	0.661
	Female	72	5(6.9)	67(63)		
	Total	113	7(6.2%)	106(93.8)		
Age	15-24	6	0(0)	6(5.7)	4.555	0.336
	25-34	37	2(5.4)	35(33)		
	35-44	29	4(13.8)	25(23.6)		
	45-54	26	1(3.8)	25(23.6)		
	55-64	15	0(0)	15(14.2)		
	Total	113	7(6.2%)	106(93.8)		

Table 3 Bivariate and multivariate analysis risk factors for HBV infection among HIV-positive individuals in Debark Hospital, North west Ethiopia between February to June, 2018.

Variables	Category	Positives n(%)	Negatives n(%)	COR(95%CI)	P.value	AOR(95%CI)	P value
Sex	Male	2(4.9)	39(95.1)	0.087(0.137,3.712)	0.663	-	-
	Female	5(6.9)	67(93.1)	1		-	-
Marital Status	Single	1(7.1)	13(92.9)	1.444(0.80,26.230)	0.804	-	-
	Married	3(5.4)	53(94.6)	1.963(0.82,21.018)	0.577	-	-
	Divorced	2(6.1)	31(93.9)	1.722(0.140,21.246)	0.672	-	-
	Widow	1(10.0)	9(90)	1			
Occupation	Farmer	1(10)	9(90)	1.444(0.117,17.904)	0.775	-	-
	Merchants	2(7.1)	26(92.9)	1.333(0.073, 24.315)	0.846	-	-
	Civil Servants	1(7.7)	12(92.3)	2.22(0.181,27.262)	0.611	-	-
	House wife	2(4.8)	40(95.2)	2,111(0.118,37.722)	0.611	-	-
	Driver	1(5)	19(95)	1			
Residence	Rural	5(15.2)	28(84.8)	6.854(1.378,37.959)	0.025*	4.566(0.703, 29.672)	0.112
	Urban	2(2.5)	78(92.5)	1			
Tattooing	Yes	2(25)	6(75)	6.667(1.064, 41.773)	0.043*	2.675(0.204,27.458)	0.405
	No	5(4.8)	100(95.2)	1			
Habit of drinking alcohol	Yes	6(11.5)	46(88.5)	7.826(0.910,67.291)	0.061	7.939(0.671,94.079)	0.100
	No	1(1.6)	60(98.4)				
Multiple Sexual Partner	Yes	3(18.8)	13(81.2)	5.365(1.077, 26.770)	0.040*	9.718 (0.378,249.705)	0.170
	No	4(4.1)	93(95.9)	1			
Dental Procedure	Yes	5(11.1)	40(88.9)	4.125(0.764, 22.271)	0.0100*	1.261(0.152,10.426)	0.830
	No	2(2.9)	66(97.1)	1		1	
Surgical History	Yes	4(22.2)	14(77.8)	8.762(1.771,43.357)	0.008*	0.536(0.018,16.151)	0.830
	No	3(3.2)	92(96.8)	1			

*Significant at p value 0.05

DISCUSSION

The overall prevalence of HBV infection in the study area (6.2%) agreed with the results reported in Debre Tabor (6.1%) (Balew *et al.,* 2014), in Mekelle (5.9%) (Weldemhret *et al.,* 2016), in Hawassa (6.9%) (Belayneh, 2015), blood donors in Amhara and Tigray regions (5.7 %) (Gelaw *et al.,* 2008), and among pregnant women attending an antenatal clinic in Jigjiga (6 %) (Wondimeneh *et al*., 2013). On the contrary, the prevalence of HBV infection was lower than the previous reports among HIV-infected patients in Shashemene (14%) (Negero *et al.,*2011) and in Bahir Dar (19%) (Birku *et al.,* 2015). It was relatively lower among blood donors in Jigjiga (9.48%) (Abate *et al.,* 2016) and among street dwellers in Gondar City (10.9%) (Moges *et al*., 2006). It is also lower than some studies in African countries such as Nigeria (11.5%) (Adewole *et al*., 2009), Ghana (15%) (Ampofo *et al*., 2002), Sudan (11.7%) (Mudawi *et al.,* 2014*),* and the Gambia (12.2%) (Jobarteh *et al.,* 2010) among HIV-infected individuals. The variation might be due to the differences in study design, HBV endemicity, and the clinical characteristics of the study participants. Better awareness of HBV infection in HIV-infected individuals might be the other possible explanation for the lower prevalence of HBV in the present study (Ayele *et al*., 2020).The lower prevalence of HBsAg in the present study may possibly be partially attributable to the ability of some HIV medications, such as lamuvidine, to eradicate HBsAg (Jobarteh., 2010).

However, the prevalence of HBV in the present study was higher than in previous studies in Ethiopia among HIV-positive adults in Jimma (3%) (Awole and Gebre-Selassie, 2005), in Arba Minch (4.3%) (Yohanes *et al.,* 2015), and among HIV-infected patients in Addis Ababa (3.9%) (Shimelis *et al.,* 2007). It also was higher than some studies done among different population groups in Ethiopia among military personnel in Bahir Dar (4.2%) (Birku *et al.,* 2015) and health professionals in Addis Ababa (2.4%) (Desalegn and Selassie, 2013). It is also higher than the reports among HIV-infected patients in Uganda (2.4%) and Ruanda (4.1%) (Pirillo *et al.,* 2007).

It's possible that the variation is brought on by different levels of information accessibility on the virus's spread and prevention. In addition, HIV-infected people may have weaker immunity, which could lead to an increase in prevalence in the current study.

The prevalence of HBV was 4.9% among males and 6.9% among females. Similar to the present study, a higher prevalence of HBV was reported in females than males in Hawassa (7,7% Vs 5.5%) (Belayneh, 2015). Females might have a greater risk of HBV during birth, abortion, and surgical history (WHO, 2021). The highest seroprevalence (14.3%) was recorded in the age range 45 to 54 years. A similar finding was reported in studies conducted in Shashemene (8.8%) (Negero *et al.,* 2011) and Debre Tabor (6.1%) (Balew *et al.,* 2014). The possible justification might be having multiple sexual partners and alcohol drinking behavior in this age group increased HBV prevalence. Our results showed a higher prevalence of HBV in study participants that had multiple sexual partners and those that drank alcohol. This study revealed that rural residents were 6.8 times more likely to be exposed to HBV than urban residents. It agreed with the report from Bahir Dar (AOR = 3.2, CI =1.2-8.2, P-value = 0.001) (Abera *et al*., 2014). An earlier study in Madagascar found a significant variation in the prevalence of HBsAg between urban (5.3%) and rural (26.0%) areas (Boisier *et al*., 1996).

The use of inadequately sterilized needles, razor blades, and other sharpened materials for different purposes might be responsible for the higher prevalence of HBV in rural areas in the present study (Singh *et al*., 1998). In the present study, socio-demographic characteristics such as marital status, occupation, and educational status were not statistically associated with HBV infection. However, having multiple sexual partners increase the risk of infections more than five

times compared to single sexual partner (COR= 5.37, CI = 1.077-26.77, P-value = 0.040). In the same manner, HBV positivity was associated with having multiple sexual partners in studies done in Mekelle (COR = 4.4 CI = 1.5-12.5, P-value = 0.06) (Weldemhret *et al*., 2016), in Debre Tabor (COR = 5.53, CI = 1.32-23.1, P-value = 0.027) (Balew et al., 2014) and in Brazil (COR = 1.5, CI = 1.06-2.07, P-value=) (Lewis-Ximenez et al., 2002). The possible justification might be people with multiple sexual partners will be prone to HBV infections and sexually transmitted diseases (Lavanchy, 2004).

Furthermore, significantly higher prevalence of HBV was observed among individuals having surgical history (COR = 8.762, CI =1.77-43.34, P-value = 0.008). It agrees with the reports from Bahir Dar (COR = 12.9, CI = 3.84-43.37 P-value = 0.001) (Zenebe et al., 2014) and Mekelle (COR = 2.2 CI = 1.6-4.8, P-value = 0.058) (Weldemhret et al., 2016). Poorly sterilized surgical equipment might increase HBV infection during surgery (Khan, et al., 2000).

Study participants who had body tattoos were 6.7 times more likely to be infected with HBV. Studies conducted in Deberemarkos (COR = 2.88, CI =1.07-7.54, P-value = 0.09) (Yeneanchalem, *et al*.2018) and Bahir Dar (COR = 5.1, CI = 5.36-19.32, P-value = 0.02) (Zenebe *et al*., 2014) also reported the association of body tattooing with HBV infection. Unsafe needles and other sharp materials used for tattooing might facilitate the transmission of HBV in the study area (Khan et al., 2000).

CONCLUSIONS AND RECOMMENDATION

The study showed that HBV infections are important public health problems in HIV-infected individuals. Rural residence, body tattoing, multiple sexual partners, and surgical history were risk factors of HBV infections. Thus, health education about the risk factors in particular and the mode of transmission in general should be given.

Data Availability

All data generated or analyzed during this study are included in this published article.

Ethical Approval

The proposal for the study was reviewed and approved by the ethical review committee of the College of Natural and Computational Science, University of Gondar. Written assent and consent was obtained from all participants and parents.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

MM: Conducted sample collection, processing and data analysis; ST identified the research problem, supervised the work, and wrote the manuscript; MA: identified the research problem, supervised the work and reviewed the manuscript.

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