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Hepatitis B Virus Infection and Associated Factors among Blood Donors at Dire Dawa, Eastern Ethiopia

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Abstract

Background: Globally, more than 2 billion people have been infected with Hepatitis B Virus (HBV) at some time in their lives. Of these, about 350 million people remain infected chronically and become carriers of the virus. The main aim of this study was to assess the prevalence of HBV infection and associated factors among blood donors at Dire Dawa Blood Bank Service in Eastern Ethiopia.

Methods and materials: This study involves cross-sectional retrospective record review on 4,157 blood donors. During analyzing the data, descriptive analyses was made to determine the prevalence of hepatitis B virus in the study population. Finally, multivariable logistic regression model was used to identify factors associated with hepatitis B virus infection.

Result: Out of the 4,157 individuals who donated their blood at Dire Dawa Blood Bank Services, 155 (3.73%) (95% Confidence Interval (CI)=3.15-4.31) confirmed having a sero-prevalence positive for HBV. HBV sero-prevalence has shown a statistical significance association with male sex (Adjusted Odds Ratio (AOR)=1.93, 95% CI=1.10-3.55) (p=0.036) and age group 33-40 (AOR=3.7, 95% CI=1.19-9.56) (p=0.029).

Conclusion: The prevalence of HBV infection in this study is high and the disease is still a major health problem in the region which calls for high alert public health intervention.

Keywords: HBV infection; Blood bank services; Blood donors; Dire Dawa; Ethiopia

Introduction

Hepatitis is an inflammation of the liver, most commonly caused by a viral infection. Of these viruses, hepatitis B virus (HBV) infections account for a substantial proportion of liver diseases worldwide. HBV is responsible for liver damages ranging from minor disorders to liver cirrhosis and hepatocellular carcinoma (HCC) [1].

Hepatitis B virus (HBV) occurs worldwide and constitutes a serious public health problem [2]. Globally, more than 2 billion people have been infected with HBV at some time in their lives. Of these, about 350 million people remain infected chronically and become carriers of the virus [3]. Hepatitis B virus infection is estimated to be the cause of 30% of cirrhosis and 53% of liver cancer worldwide [4]. Most of the deaths (94%) were attributed to complications of chronic infection, such as cirrhosis and HCC, and only 6% were attributed directly to acute hepatitis B [5]. Hepatocellular carcinoma is the sixth most common cancer and the third most common cause of cancer death in the world [6]. Chronic HBV infection is the most common cause of HCC, accounting for 50% of HCC cases worldwide and up to 80% of cases in high HBV endemic regions [7].

HBV is transmitted through exposure to infective blood, semen, other body fluids, or from infected mothers to infants at the time of birth. Transmission may also occur through transfusions of HBV contaminated blood and blood products, contaminated injections during medical procedures, and through injection drug use. Sexual transmission is also possible [8].

Although previous studies have described prevalence of HBV infection in Ethiopia, their data included commercial donors, and only few studies identified determinant factors. In addition, an increasing trend in Hepatitis B surface Antigen (HBsAg) detection rate (currently 20%) across health facilities in the study area demands assessment of local data. The findings from this retrospective study reflects the problem in the community and as a result it will serve as an input for concerned body for planning effective intervention strategies to decrease HBV prevalence and improve blood safety in transfusion services. The study will also provide baseline information for future prospective studies. Therefore, this study assessed prevalence of HBV infection and its determinant factors among blood donors in Dire Dawa, Eastern Ethiopia.

Methods

Study setting

This study was conducted at Dire Dawa Blood Bank Services, in Dire Dawa City Administration of eastern Ethiopia. Dire Dawa is located 515 Km to the east of the capital city, Addis Ababa. Dire Dawa Blood Bank Services provides comprehensive services (whole blood,

packed cells, plasma) to all public and private health facilities in the city.

Study design

Cross-sectional retrospective study design was used in a total of 4,157 individuals who donated their blood at Dire Dawa Blood Bank Services between June 2009 and June 2014. Socio-demographic factors (sex, age, occupation, residence) and type of donation were used as independent variables. The study's outcome measure was donors' HBSAg sero-status at the time of donation.

Participants

The study population was comprised of donors who donated their blood from June 2009 to June 2014 at Dire Dawa Blood Bank Service. Donors with incomplete records or without confirmatory ELISA test results for HBSAg were excluded from the study. The sample size for this study was determined using a double population proportion by taking the most significant difference in proportion of HBV infection between two groups from a previous study [9]. Study participants were selected by simple random sampling from a list of random number table generated using donors' unique ID given at the blood bank.

Data collection and quality control

Data collection format was developed to gather the required information by adopting from the National Blood Bank Services' donor eligibility assessment and laboratory request forms. The data were collected by reviewing donors' assessment and laboratory test result records at the blood bank.

Two experienced nurses were involved in data collection after they were trained about data collection procedures for one day. The principal investigator oversaw the overall process. The data used in this study was acquired after approval of ethical clearance from Haramaya University and Dire Dawa Regional Health Bureau. And no personal identifiers of the study participants were used throughout the study.

Data processing and analysis

All completed data collection forms were examined for completeness, consistency and clarity during data management, storage and analysis. The data was coded, entered, and cleaned before analysis. Exploration of data was made to check for any inconsistencies, coding error, out of range, and missing values and appropriate corrections were made.

Descriptive analyses were done to determine the prevalence of hepatitis B virus in the study population and its distribution categorized by independent variables. Chi-square test was done to assess factors associated with hepatitis B virus infection. Binary logistic regression was used to determine crude estimates of factors associated with hepatitis B virus infection. Finally all variables at $p \leq 0.25$ in the bi-variable analysis were entered into the multivariable model to identify the significant independent determinants of hepatitis B virus infection. All tests were made with $p<0.05$ level of significance. All analyses were done using SPSS v20.0 for windows (SPSS® Inc., Chicago, IL, USA).

Results

A total of 4,157 individuals who donated their blood at Dire Dawa Blood Bank Services were included in this study. Three thousand four hundred thirty four (82.6%) donors were males and majority (41.3%) of the blood donors were between age 18 & 24 years of old. Most of the donors, 3771 (90.7%), live in urban areas and the highest blood donation was made by students (32%). Replacement donations constitute majority, (76%), of the blood donated at the blood bank (Table 1).

Variables		Total	HBV Positive	HBV Negative	χ^2 (p value)
		N (%)	N (%)	N (%)	
Sex of the donor	Male	3434 (82.6)	140 (4.1)	3294 (95.9)	6.67 (0.01)
	Female	723 (17.4)	15 (2.1)	708 (97.9)	
Age category	18–24	1718 (41.3)	53 (3.1)	1665 (96.9)	13.78 (0.01)
	25–32	1291 (31.1)	47 (3.6)	1244 (96.4)	
	33–40	657 (15.8)	40 (6.1)	617 (93.9)	
	41–48	294 (7.1)	11 (3.7)	283 (96.3)	
	≥ 49	197 (4.7)	4 (2.0)	193 (98.0)	
Place of residence	Urban	3771 (90.7)	135 (3.6)	3636 (96.4)	2.50 (0.11)
	Rural	386 (9.3)	20 (5.2)	366 (94.8)	
Occupation	Student	1329 (32.0)	45 (3.4)	1284 (96.6)	7.99 (0.33)
	Self employed	851 (20.5)	32 (3.8)	819 (96.2)	
	Civil servant	481 (11.6)	12 (2.5)	469 (97.5)	
	Unemployed	593 (14.3)	31 (5.2)	562 (94.8)	

	Farmer	253 (6.1)	13 (5.1)	240 (94.9)	
	Private employee	238 (5.7)	8 (3.4)	230 (96.6)	
	Driver	211 (5.1)	8 (3.8)	203 (96.2)	
	Other	201 (4.8)	6 (3.0)	195 (97.0)	
Type of donation	Volunteer	999 (24.0)	24 (2.4)	975 (97.6)	6.44 (0.01)
	Replacement	3158 (76.0)	131 (4.1)	3027 (95.9)	

Table 1: Association of socio-demographic characteristics of blood donors and HBV sero positivity at Dire Dawa Blood Bank Services in Eastern Ethiopia, June 2009-June 2014 (n=4,157).

Prevalence of HBV infection

The sero-prevalence of HBV in this study was 3.73% (CI: 3.15-4.31). There was a statistically higher HBV prevalence among males (4.1; 95% CI: 3.5-4.8), donors between 33-40 years of age (6.1; 95% CI: 4.5-8.2) and replacement donors (4.2; 95% CI: 3.5-4.9) compared to females (2.1; 95% CI: 1.3-3.4), donors aged 18-24 years of age (3.1; 95% CI: 2.4-4.0) and volunteer donors (2.4; 95% CI: 1.6-3.4), respectively (Table 1).

Factors associated with HBV infection

In the bivariate analysis, sex, age and type of donation were associated with HBV infection. However, in the multivariable analysis, the significant independent predictors were male sex (AOR=1.95, 95% CI=1.12-3.41) (p<0.05) and age group 33-40 (AOR=3.52, 95% CI=1.23–10.03) (p<0.05) (Table 2).

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)	P value
Sex			
Male	2.01 (1.17, 3.44)	1.95 (1.12, 3.41)	0.019
Female	1	1	-
Age category			
18-24	1.54 (0.55, 4.29)	1.64 (0.55, 4.89)	0.373
25-32	1.82 (0.65, 5.12)	2.06 (0.73, 5.84)	0.175
33-40	3.13 (1.11, 8.85)	3.52 (1.23, 10.03)	0.019
41-48	1.88 (0.59, 5.98)	2.06 (0.65, 6.61)	0.222
≥ 49	1	1	-
Residence			
Urban	1	1	-
Rural	1.47 (0.91, 2.38)	1.32 (0.60, 2.93)	0.491
Occupation			
Student	1	1	-
Self employed	1.12 (0.70, 1.77)	0.67 (0.38, 1.21)	0.185
Civil servant	0.73 (0.38, 1.39)	0.50 (0.24, 1.03)	0.06
Unemployed	1.57 (0.99, 2.51)	1.11 (0.62, 1.97)	0.732
Farmer	1.55 (0.82, 2.91)	0.73 (0.25, 2.12)	0.565
Private employee	0.99 (0.46, 2.13)	0.71 (0.31, 1.62)	0.413
Driver	1.12 (0.52, 2.42)	0.70 (0.30, 1.60)	0.392
Other	0.88 (0.37, 2.09)	0.54 (0.22, 1.38)	0.199
Type of Donation			
Volunteer	1	-	-
Replacement	1.76 (1.13, 2.73)	1.46 (0.91, 2.34)	0.113

Table 2: Factors associated with HBV sero positivity at Dire Dawa Blood Bank Services in Eastern Ethiopia, June 2009-June 2014 (n=4,157).

Discussion

The sero-prevalence of HBV on this study was 3.73% (95% CI=3.15-4.31). This finding was lower as compared to a study in Gondar, Ethiopia (4.7%) [9] and other countries such as, 9.6% in Ghana [10] and 4.38% in China [11]. On the other hand, the prevalence of the current study was higher than studies in Jimma, Ethiopia (2.1%) [12], 1.32% in India [13] and 0.19% in Central West Brazil [14]. This could be due to higher proportion of replacement donors in this study (76%), compared to 44.8% reported in a similar study done in India [13].

Males were twice as likely to be positive for HBsAg (AOR=1.95; 95% CI=1.12-3.41, p<0.05) compared to females. This is consistent with findings from other studies in Gondar and Jimma of Ethiopia, where males have 1.52 (p<0.05) and 4.12 (p<0.001) times higher risk than females respectively [9,12]. Findings from other countries have also documented statistically significant increased risk for HBV infection among male donors compared to females [11,15,16]. The increased risk for HBV infection in males could not be justified by our data. The difference could probably be due to males are more proactive in deciding to donate blood [15] as explained by our result. Another important contributing factor for higher seroprevalence in males would be a lower rate of HBsAg seroclearance compared to females [16]. Further investigations are needed for better understanding of these relationships.

Similarly, age group 33-40 was 3.5 times as likely to be HBsAg positive (AOR=3.52; 95% CI=1.23-10.03, p<0.05) compared with age

group 49 years and above. Other studies in Ethiopia have found an increased risk by 1.78 to 2.17 ($p<0.005$) among donors aged 26-45 and 2.40 to 2.52 ($p<0.001$) among donors aged 30–39 [12] compared to those aged above 45 years and below 20 years of age, respectively. Similar studies in other countries have shown that age to be one of the independent predictors of acquiring HBV infection [11,15,16]. The higher prevalence of HBsAg detected in age group 33-40 in our study would probably be the birth cohort effect and presumptively due to lack of immunization against HBV in their times [14,16]. Lower risk for HBV infection among donors above 49 years might have resulted from a spontaneous clearance of HBsAg over time [11,17-20]. In addition, a lower survival in patients with compensated cirrhosis might lead to decreased prevalence in older age.

Findings in this study need to be interpreted in light of its methodological limitation on that it did not include all personal risk factors due to the nature data source. Therefore, there is a need for community based HBV infection study in order to further investigate associated risk factors which are crucial to implement effective prevention program of HBV infection in the region.

Competing Interests

The authors (s) declare that they have no competing interests.

Authors' Contributions

YH was the lead author who led the design, data collection and development the study, and narrated this manuscript for publication. BS participated in the study design and analyses of results. TA participated in the design, interpretation of findings, and development of manuscript. All authors read and approved the final manuscript.

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