

Sero-Prevalence and Associated Factors of Hepatitis B Virus Infection among Health Professionals in Adama Town, Oromia, Central Ethiopia

Yilma G¹, Deksisa A², Dulo B³, Shiferaw T³ and Lemi H²

¹Expert MLT working on Adama General Hospital and Medical College, Adama, Oromia, Ethiopia

²Lecture at Public Health Department, Adama Hospital Medical College, Adama, Oromia, Ethiopia

³Lecture at Biomedical Science Department, Adama Hospital Medical College, Adama, Oromia, Ethiopia

*Corresponding author: Deksisa A, Lecture at Public Health Department, Adama Hospital Medical College, Adama, Oromia, Ethiopia, Tel: +251-0911069074, E-mail: alexdugna@gmail.com

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Abstract

Introduction: Hepatitis B is an infectious disease that caused by hepatitis B virus infection. Hepatitis B virus replicates in the liver and causes both acute and chronic hepatitis. The virus predominantly transmitted through a blood and sexual contact from potential sources. Healthcare professionals are at great risk of occupational exposure to this virus.

Objective: To assess the sero-prevalence and associated factors of Hepatitis B virus infection among healthcare professionals in Adama town Oromia region, Ethiopia, from December 1/ 2018 – February 30/2019.

Methods: A cross sectional study was conducted, a total of 457 health professionals were included in the study by using simple random sampling. Data on socio-demographic characteristics and associated factors for Hepatitis B virus infection was collected by structured interviewer administered questionnaire and 3-5ml of blood sample was collected, all specimen collection and processing was done following standard operating procedures, ELISA testing was used. Data entry was done by EPI info version 7, and analyzed using SPSS version 20. Both Bivariate and Multivariate logistic regression model was used to assess the relationship between independent and Outcome variables. Those factors showing a P- value < 0.05 was considered statistically significant.

Result: Out of 457 health professionals screened for HBV surface antigen, the overall HBV infection was 8 (1.8%). The high rate 7 (3.1%) of infection was detected among age group of 30–39 years. Four (16%) of the study Participants had no experience of hand wash before and after patient and sample contact (P = 0.019 and this was statistically significant. Two (5.5%) of participants with history of body fluid splash in cutaneous and mucocutaneous exposure were positive for HBsAg (P = 0.030), it was statistically significant. Among those who had history of Multiple sex partners of the study participant are statistically significant, one (25%) were positive for HBsAg (P = 0.010).

Conclusion and recommendation: The prevalence of HBV infection among health care professional was 1.8%. Multiple sex partners, not hand washing before and after patient contact and body fluid splash was significantly associated with HBV infection. All health professional -wide hepatitis immunization program should further implemented, The Ministry of Health could consider offering subsidized or free Hepatitis B vaccination to HCWs and trainings on infection prevention should be more readily available for these high risk groups.

Keywords: Health Care Workers; HBV; HBsAg; Hepatitis; Occupational Hazards

Introduction

Hepatitis is caused by infection with the hepatitis B virus (HBV), a partially double-stranded DNA virus of the family hepadnaviridae. HBV replicates in the liver and causes both acute and chronic hepatitis. Although the highest concentrations of virus are found in blood, other body fluids, such as semen and saliva, have also been demonstrated to contain HBV. HBV is predominantly a blood and sexually transmitted infection by percutaneous and mucosal exposure to infectious body fluids [1].

HBV infection is the most common blood-borne virus in the healthcare setting. Interaction with patients infected with HBV is likely to pose unavoidable safety risks for the health care workers (HCW's) [2,3]. The risk of HBV infection among HCWs is estimated to be 3 to 5 times higher than the general population, pathologists, physicians, laboratory technicians, nurses, and others. The global annual estimate of HCW's exposed to HBV infection is estimated at 5.9% [4,5]. Research findings indicate 10 - 30% of HCWs exhibit serologic evidence of past or present HBV infection [6,7]. In developing countries, 40 - 60% of HBV infections in HCWs are attributed to occupational hazards [8,9].

The situation is more difficult in Asian and sub-Saharan African countries. Insufficient coverage of HBV vaccination, injection drug users, unsafe blood transfusion, and inadequate health precautions are major risk factors for HBV infection in these regions [10-12].

The World Health Organization (WHO) estimates that the prevalence of HBV infection in Africa is on average more than 10% [11]. Africa has the second largest number of chronic carriers (> 8%) next to Asia [13]. Ethiopia is considered to have a medium to high HBV infection rate [14,15].

Although most infections in the developing world occur in childhood and early adulthood, a significant portion of adults remains at risk [16-23]. Hepatitis B virus infection is a recognized occupational hazard for unvaccinated HCW individuals who perform invasive procedures and handle human specimens are at high risk of exposure [19-24].

HBV is preventable and controlled through pre-exposure vaccination and practicing standard safety precautions [10]. However, Hepatitis-B vaccination coverage among HCWs is very low in developing countries. The main reasons for this heightened risk for transmission include poor awareness of the risk factors, and low priority given by the health management in government and private health sectors in universal precautions [25].

Many health care workers are exposed to blood or other body fluids. If the fluid is infected with the virus and comes in contact with the healthcare worker's blood or mucous membranes, there is a 10 to 30 percent chance of becoming infected with the hepatitis B virus. The Hepatitis-B vaccine was introduced in the national program of immunization (NPI) in 2005 in Ethiopia. However, vaccination against HBV is not compulsory in HCWs in the country, yet only a few HCWs admitted that they were vaccinated. In addition, periodic surveillance for assessing occupational exposures is very low and calls for better attention. This study was done to assess the burden and risk factors of HBV infection among HCWs working in Adama town.

Materials and Methods

Study design and setting

Institution based cross sectional study was conducted. The study was conducted in Adama town, which is located about 99kms east of Addis Ababa (the capital city of Ethiopia). It is subdivided into six (6) sub city, 18 kebeles and has an estimated total population of 341,796 (170,843 males and 170,953 female) the current 2007 census conducted by the Central Statistical Agency of Ethiopia, Adama is one of the largest and fastest growing towns in Oromia.

It is a business center and is characterized by a highly mobile population in Ethiopia, A total of 782 health professionals working, at 7 government health centers, 167 health professionals are working in government health centers, 97 private clinics, 428 health Professionals working in private clinics and 17 specialized private clinics, 187 health professionals working in this specialized private clinics in Adama town. The study was conducted from December 1/ 2018 – February 30/2019.

Sample size determination

The required sample size 457 for the study was determined by using a single population proportion formula, $n = (Z\alpha/2)^2 P(1-P)/ d^2$. Where, n = the number of health care workers to be studied; $Z \alpha / 2$ = standardized normal distribution value for the 95% confidence interval, which is 1.96, $P = 0.0902$ from previous study in Addis Ababa, Ethiopia [42] and d = the margin of error taken 3%, final population correction and 10% non-response rate.

Sample Size Determination for the first specific objective $n = \frac{(z/\alpha_2)^2 \times P(1-P)}{d^2}$

$$n = \frac{(1.96)^2 \times 0.0902(1-0.0902)}{(0.03)^2} = 350$$

Since sampling is from a finite population of size N, then

$$n = \frac{n_0}{\left(1 + \frac{n_0}{N}\right)}$$

Actual sample by using population correction formula becomes $230 + 10\% \text{ Non-response rate} + 1.5 \text{ design effect} = 271$

Variables	Power	OR	CI	Ratio unexposed/ exposed	%outcome unexposed	Sample size
Jaundice	80	10.5	95%	13.92	1.66	435
Multi-sex partner	80	7.0	95%	3.85	1.62	347
Contact history	80	6.8	95%	5.47	1.52	457

The Maximum sample size obtained by comparing the two objectives the largest sample size is 457 is used to address both objectives.

Table 1: Sample Size calculation for Objective two for the association between hepatitis B viral infections and the Socio-demographic information of health professionals by epi info StatCalc [26]

Subjects

First health facilities stratified based on work institutions type and, the number of HCWs was allocated proportionally to each institution. Then simple Random sampling technique was employed to select HCWs at each health center and private clinics by using personnel attendances as a sampling frame. This sampling was done thinking that health professionals in the government health center and private clinics have different workload, number and activities of the total health professionals in the town where selected to show the impact health service activities as risk for HBV infections (Figure 1).

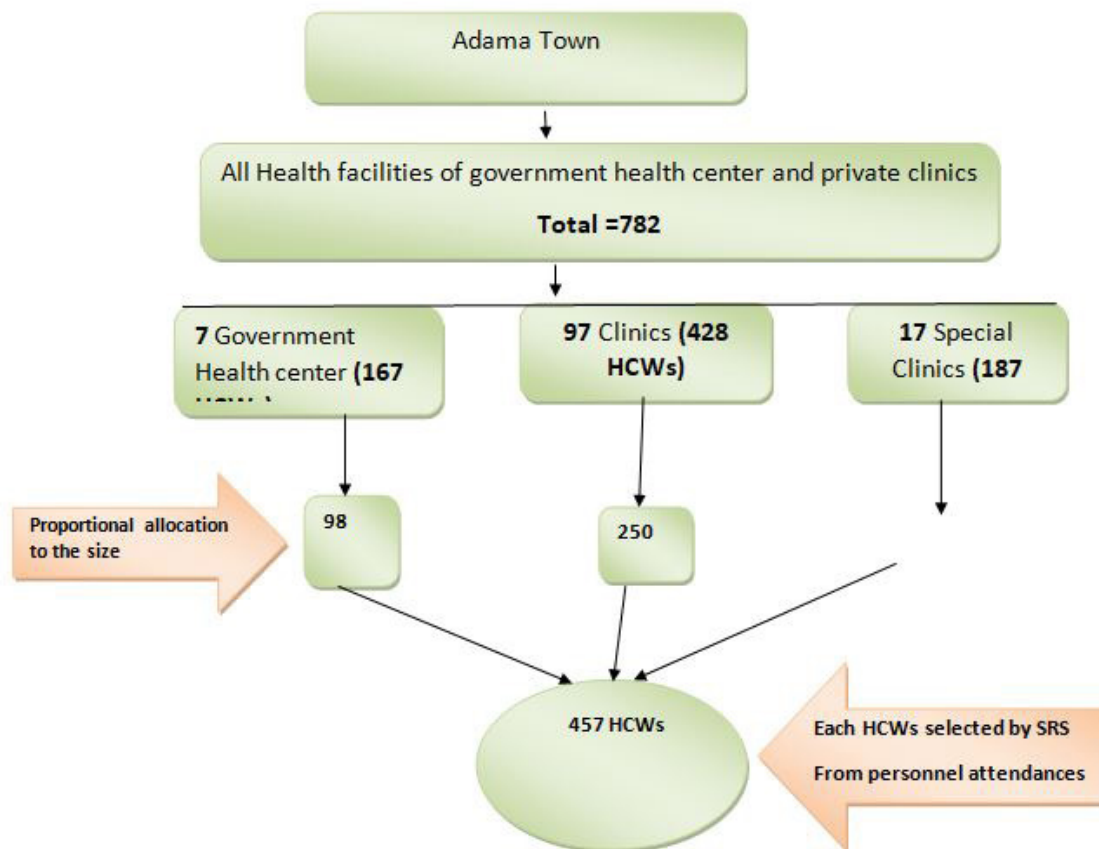


Figure 1: Sampling procedure for selection of all health facilities of government health centers and private clinics in Adama city, Ethiopia, 2019

Data collection

A structured, questionnaire was used to collect socio-demographic data and associated factors from each participant. Data collection was conducted after explaining the objectives of the study and receiving consent from each of the study participant. Data was checked for completeness, accuracy and consistency during sample collection and administration of questionnaire. In case of blood sample collection and processing, using an aseptic technique, about 3-5 ml of blood was collected following standard operating procedures (11) and transferred into immediately put in a vacuonier containing a clot activator a serum separator tube. The vacuoniers were labeled indicating the serial number and date of sample collection. The Blood samples were taken to the laboratory for separating and storage sera. The blood was permitted to clot and the serum separated afterwards by centrifuging it at 5000 revolutions per minute (rpm) for 5 minutes and then serum was transfer into a Cry tube. Sera was stored at -20°C awaiting investigations. AID™ HBsAg ELISA Diagnostic kit was used for Hepatitis B virus surface Antigen detection and interpretation of test results was as per manufacturer's guidelines.

To make sure that the questionnaire was appropriate and understandable, it was pretested on all health Professionals working at the Government health centers and private clinics other than the actual study sites. The collected data was checked daily for consistency and accuracy. Standardized operating 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 collected data were coded, cleaned, and entered into Epi info version 7 and exported to Statistical Package for Social Sciences version 20 (SPSS 20) for analysis. Data organization presentation and summarization was done as appropriate to answer the objectives.

Independent variables with P _value of <0.25 was considered a candidate for the multiple logistic regression model. Bivariable and multivariable analysis was done using a binary logistic model to estimate the OR at 95%CI. P-value ≤ 0.05 was used as cut-off points to declare significance in the final model.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethical Review Board (IRB) of Adama Hospital Medical College, Oromia Regional State Health Bureau and the respective Adama liyu Zone, Adama town health Office and Adama town blood bank were communicated with IRB letter before enrolling any of the eligible study participants, the purpose and the benefit of the study was discussed with each participants. Written informed consent was obtained from all the study participants and confidentiality was maintained throughout the study. Those who were not interested to involve in the study by direct interviewing and blood sample collections were excluded. Those health care workers found to be positive for HBV infection were linked to Adama hospital medical college for care and treatment.

Results

Socio demographic characteristics of the study participant

A total of 457 health professionals were participated in this study. Males accounted 217 (47.5%) female accounted 240 (52.5%) and the median age for all study participants were 30 with inter-quartile range of 27-34 and the minimum and maximum age was 22 and 50 years respectively. Almost half 235(51.4%) of the participants were Orthodox Christians. Among the study participants 168(36.8%) were Diploma holders, 247(60%) have first degree, 6(1.3) were Medical Doctors and 9(2%) graduated with MSc degree. Regarding the marital status of participants about 197(43.1%) were single and 235 (51.0%) were married. Among HCWs participated in the study, 359(78.6%) work in private clinics. Above one third 178 (38.9%) of health professionals work in OPD Unit. 252 (55.1%) of health professionals work experience was between 6-10 years (Table 1).

Variables	Frequencies	Percentage (%)
Age (years)		
20 – 29	202	44.2
30 – 39	227	49.7
40+	28	6.1
Gender		
Male	217	47.5
Female	240	52.5
Religion		
Orthodox	235	51.4
Muslim	105	23.0
Protestant	115	25.2
Others	2	0.4
Marital status		
Married	233	51.0
Single	197	43.1
Divorced	23	5.0
Windowed	4	0.9
Level Of Education		
Diploma	168	36.8
Degree	274	60.0

Variables	Frequencies	Percentage (%)
Doctorate Degree	6	1.3
MSc	9	2.0
Specialization	0	0
Health Professional work place		
Government health center	98	21.4
Private clinics	359	78.6
Department of health professional working		
OPD	178	38.9
Laboratory	105	23.0
Emergency	79	17.3
Gyn	49	10.7
Pharmacy	32	7.0
Ward	7	1.5
Others	7	1.5
Service Years of health professionals		
1 – 5 Years	124	27.1
6 – 10 Years	252	55.1
11 – 15 Years	69	15.1
+16 Years	12	2.6

Gyn; Gynecology, OPD; Out Patient Department

Table 2: Socio-demographic characteristics of health professionals working in government health center and private clinics in Adama town, Oromia region, Ethiopia, 2019

Individual and health related characteristics of study participant

The Majority of the health care workers 446 (97.6%) wear gloves. From the total of the study participants, hand washing before and after each patient and sample contact was 432 (94.5%), and also almost one fourth 110 (24.1%) had encountered body fluid splash. From the total of study participants 440 (96.3%) had no training on HBV infection prevention. In addition some of health care provider 82 (17.9%) and 4(0.9%) have unprotected sex and multiple sex partner, respectively. Out of the total, 413 (90.4%) had no contact history of HBV (Table 2).

Variables		Frequencies	Percentage (%)
Wear Glove	Yes	446	97.6
	No	11	2.4
Hand Wash	Yes	432	94.5
	No	25	5.5
Needle stick Injury	Yes	65	14.2
	No	392	85.8
Body Fluid Splash	Yes	110	24.1
	No	347	75.9
Hospitalization	Yes	50	10.9
	No	407	89.1
Surgical Procedure	Yes	24	5.3
	No	433	94.7
Dental Procedure	Yes	92	20.1
	No	365	79.9

Variables		Frequencies	Percentage (%)
Transfusion	Yes	5	1.1
	No	452	98.9
Unprotected Sex	Yes	82	17.9
	No	375	82.1
Multiple sex partner	Yes	4	0.9
	No	453	99.1
Contact History of HBV	Yes	44	9.6
	No	413	90.4
Training on HBV	Yes	17	3.7
	No	440	96.3
Jaundice History	Yes	6	1.3
	No	451	98.7

Table 3: Individual and health related characteristics of health professionals working in government health center and private clinics in Adama town, Oromia region, Ethiopia, 2019

Sero-prevalence of hepatitis B virus infection

From the total 457 health professionals screened for hepatitis B virus surface antigen, the overall prevalence of HBV infection was 8 (1.8%) with 95% CI (0.7 – 3.1%). High rate of hepatitis B virus infection was detected in participants age group of 30–39 years were more infected 7(3.1%) (Figure 2).

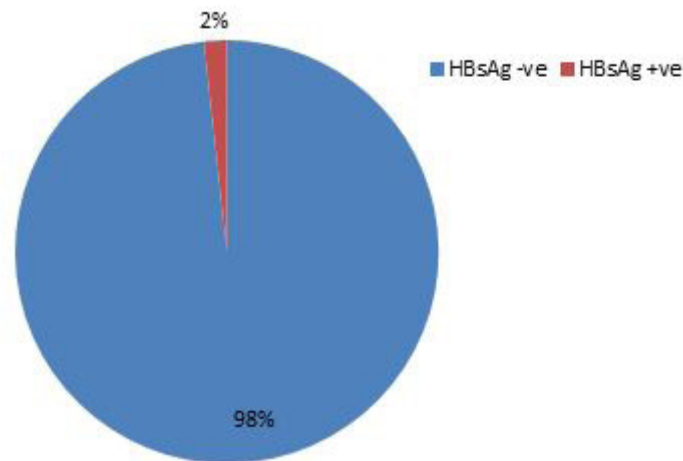


Figure 2: The overall prevalence of HBV infection among Health Professionals in Adama Town, Oromia, Ethiopia, 2019

Associated risk factors for hepatitis B virus infection

Of which, improper hand washing, history of body fluid splash and history of multiple sex partners had independent and statistically significant association with multivariable logistic regression. It was showed that 25 (5.5%), 4 (0.9%) and 110 (24.1%) study participants had a history of not washing hand properly before and after patient and sample contact, history of body fluid splash and multi-sex partner, respectively. From the total study participants 65 (14.2%) had history of needle stick injury (COR= 6.36, 95% CI = 1.55 – 26.10, P = 0.03). There were 82 (17.9%) study participants who had history of unprotected sex (COR = 34.91, 95% CI = 4.23 – 287.89,

P = 0.000. Among those who had a history of contact with HBV infected case, 5 (11.4%) were positive for HBsAg (COR= 17.52, 95% CI 4.03 – 76.09, P 0.000) those four factors are associated on Bivariate logistic regression model.

The three below risk factors are associated by multivariate logistic regression model, there were Four (16%) study Participants who had history of not hand wash properly before and after patient and sample contact, (AOR = 162.5, 95% CI = 67.32 – 368.07, P = 0.019, and this was statistically significant. Two (5.5%) of participants with history of body fluid splash in cutaneous and mucocutaneous exposure were positive for HBsAg (AOR = 26.89, 95% CI, 41.37–529.72, P = 0.030), it was statistically significant. Among those who had history of Multiple sex partners of the study participant are statistically significant, one (25%) were positive for HBsAg (AOR = 197.53, 95% CI = 83.51–431.19, P = 0.010) and the majority (96.3%) of the study participants did not take training on infection prevention protocols of various infectious diseases including HBV and 7 (1.6%) of them were positive for HBsAg (COR = 1.02, 95% CI = 1.02–1.03, P = 0.575) (Table 3).

Variables		No (%)	HBsAg positive n (%)	COR (95% CI)	P value	AOR (95% CI)	P value
Wear Glove	Yes	446(97.6)	8(1.8)	1			
	No	11 (2.4)	0(0.0)	10.98(0.97-0.99)	0.654		
Hand Wash	Yes	432(94.5)	4(0.9)	1			
	No	25 (5.5)	4(16.0)	20.38(4.76-87.19)	0.000*	162.50(67.32- 368.07)	0.019*
Needle stick Injury	Yes	65(14.2)	4(1.0)	6.36(1.55- 26.10)	0.003*		
	No	392(85.8)	4(6.2)	1			
Body Fluid Splash	Yes	110(24.1)	2(5.5)	9.95(1.98- 50.05)	0.001*	26.89(41.37- 229.72)	0.030*
	No	347(75.9)	6(0.6)	1			
Hospitalization	Yes	50(10.9)	1(2.0)	1.17(0.14- 9.68)	0.887		
	No	407(89.1)	7(1.7)	1			
Surgical Procedure	Yes	24 (5.3)	0 (0)	0.98 (0.97- 0.99)	0.502		
	No	433(94.7)	8(1.8)	1			
Dental Procedure	Yes	92(20.1)	3(3.3)	2.43 (0.57- 10.35)	0.216		
	No	365(79.9)	5(1.4)	1			
Transfusion	Yes	5(1.1)	0(0.0)	0.98 (0.97- 0.99)	0.764		
	No	452(98.9)	8(1.8)	1			
Unprotected Sex	Yes	82(17.9)	7(8.5)	34.91(4.23-287.89)	0.000*		
	No	375(82.1)	1(0.3)	1			
Multiple sex partner	Yes	4(0.9)	1(25)	21.24(1.96- 230.20)	0.000*	197.53(83.51- 431.19)	0.010*
	No	453(99.1)	7(1.5)	1			
Contact History	Yes	44(9.6)	5(11.4)	17.52(4.03- 76.09)	0.000*		
	No	413(90.4)	3(0.7)	1			
Training on HBV	Yes	17(3.7)	0(0.0)	1			
	No	440(96.3)	8(1.8)	1.02 (1.02 – 1.03)	0.575		
Jaundice History	Yes	6(1.3)	1(16.7)	12.69(1.31- 123.18)	0.005*		
	No	451(98.7)	7(1.6)	1			

Notes: - * statistically significant association P<0.05, *** Very strong, statistically significant P<0.001

Table 4: Hepatitis B virus infections and associated factors among of health professionals working in government health center and private clinics in Adama town, Oromia region, Ethiopia, 2019

Discussion

As infection with HBV remains a public health problem world-wide health professionals are among high risk groups for this infectious disease. The current study had shown that HBsAg was detected in 8 (1.8%) from 457 Health professionals participated in this study. The sero-prevalence of HBV in HCWs, in this study was higher than the study conducted in tertiary hospital of Indian HCWs (0.4%). This difference could be due to the low vaccination coverage and shortage of training on infection prevention in the study area. Compared to the WHO hepatitis B vaccine coverage estimate in African the finding from this study sowed lower among HCW where the lowest is 18% [11,27].

However, the detection rate of HBsAg among HCWs in this study area was lower than previous studies conducted in Addis Ababa (6.3%), Gondar (6.0%), Sudan (4.4%), Tanzania (7.4%), and Uganda (8.1%), respectively [28-32]. Only 20% of HCWs in Tanzania and HCWs in Sudan were vaccinated for HBV and there might be improvements in awareness on safety procedures and the importance of vaccination. With regards to the occupational risk of HBV infection in this study laboratory practitioners more infected with HBV.

This indicates that there is a difference in level of risk of exposure for HBV infection among different professions. Similar result had been reported from Uganda [31,32]. Still there is no regular and programmed protective vaccination program against HBV in Ethiopia for high risk groups like health professionals. Indeed this study show that individuals with no training in infection prevention had a higher risk of exposure (though not significant) to hepatitis B virus infection [31,32]. In this study, Bivariate and Multivariate logistic regression model was used to assess the relationship between independent and Outcome variables a statistically significant association was observed between HBV infection and history of not hand wash after contact with patient and sample. ($P = 0.019$), history of body fluid splash ($P = 0.030$), and History multiple sex partners ($P = 0.010$).

Though there is no concert national prevalence data [33] to discuss with, the detection rate of HBsAg in HCWs in this study was lower than reports from population based studies in the country. A five decade (1968–2015) systematic and meta-analysis study conducted in Ethiopia showed a pooled prevalence of 7.4% [33]. In the same study, higher prevalence of HBsAg is reported among HCW (7.3–9.0%) and medical MWH (6.0–6.3%). A community based cross-sectional study showed 3.1% HBV prevalence by detecting HBsAg [34]. This might be due to the decline in the prevalence of HBV infection in the country and the HCWs HBsAg cleared, produce anti HBs as natural immunity. The relative improvement in the accessibility of the protective vaccine and awareness regarding the prevention of the disease might contribute in the reduction of the HBV infection.

On the other hand it might indicate that working in the hospital, health center and clinics seething might be protective against HBV. It is plausible that those who are working in the Hospitals, health center and private clinics get trainings on the prevention of infectious disease more frequent than the community. They are also given a priority in vaccination as they are considered as risk groups since they deal with sort of infected sample. Most importantly the level of education and their field of specialty, especially for health care workers, are also better than the community [33,34] so that they have expected to have better awareness regarding the precautions and safety of blood borne transmission in general and HBV infection prevention in particular.

Limitation of the study

This study didn't determine different HBV bio markers. It is also difficult to distinguish cause from effect and there might be also a recall bias.

Conclusion

The prevalence of current hepatitis B virus infection among health care workers in this study is 1.8%. Multiple sex partner, improper hand washing and body fluid splash were the variables significantly associated with HBV infection.

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