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Prevalence of HBV, HCV and Associated Risk Factors Among Cleaners at Selected Public Health Centers in Addis Ababa, Ethiopia

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Abstract: Occupational exposure of public health center cleaners (PHCCs) to blood and body fluids after skin injury or mucous membrane contact constitutes a risk for transmission of blood-borne pathogens. Such pathogens include Hepatitis B virus (HBV) and Hepatitis C virus (HCV) among the primary blood born pathogen. In the industrialized world, occupational surveillance is performed to assess and monitor health hazards related to blood borne pathogens. In contrast, in developing countries, exposure and health impacts are rarely monitored and much remains to be done to protect Public health cleaners. Objective was to determine the prevalence of hepatitis B and C viruses and potential risk factors among public health center cleaners. Methods/design: A cross sectional prospective study was conducted among 252 public health center cleaners. Data was collected using pre-tested and structured questions. Venous blood was collected by trained laboratory person and the sera were tested for hepatitis B surface antigen and anti-hepatitis C antibody using enzyme-linked immune sorbent assay (ELISA) technique. Then the data was entered into Microsoft Excel sheets and exported to STAT software version 12 for analysis. Chi square and Odds ratio tests were used to assess association of risk factors with HBV and HCV positivity. A p-value of ≤ 0.05 was considered statistically significant. Results revealed that in among the total 252 PHCCs examined, HBV and HCV were detected in 9 (3.57%) and 4 (1.59%) of them respectively. Of the 9 HBV positive subjects 1(11.1%) was male and 8(3.3%) were females. However, all of the HCV positive study participants were females. It was found that none of the observed risk factors of HBV and HCV were significantly associated with the occurrence of hepatitis infection.In conclusion: The prevalence of HBV and HCV is higher in the study setting as it also revealed by other researches in our country. Therefore, it is important to implement a screening program for these diseases at large.

Key words: Hepatitis B Virus · Hepatitis C Virus · Prevalence And Public Health Center Cleaners (Phccs)

INTRODUCTION

Viral hepatitis is a major health problem worldwide and cause acute and/or chronic hepatitis which can leads to the development of extensive liver scarring (cirrhosis), liver failure, liver cancer and death. The most common types are hepatitis B virus (HBV) and hepatitis C virus (HCV). Viral hepatitis is the tenth leading cause of death and the leading cause of liver cancer worldwide [1].

These viruses are transmitted vertically at birth, horizontally through unprotected sex, sharing of injecting equipments and close contact between infants and neonates. Transmission through unscreened blood products are another route of transmission since blood remains infectious for several weeks even when dried [2]. Medical waste handlers who undergo collection, transportation and disposal of medical wastes in the health institutions are at risk of exposure to acquire those infections which transmit mainly as a result of contaminated blood and other body fluids including injury with sharp instruments, splash to the eyes or mucous membranes [3].

HBV and HCV can be ended with development of cirrhosis and liver cancer. More than 500 million people worldwide are persistently infected with either of these two viruses thus presenting a major global health problem. Because the two hepato-tropic viruses share the same modes of transmission, co-infection with the two

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viruses is common, especially in areas with a high prevalence of HBV infection and among people at high risk for infection [4].

Hepatitis B virus (HBV) infection is a major global public health problem. There are approximately 2 billion people who have been infected worldwide and more than 350 million of them are chronic carriers of HBV [5, 6]. WHO estimated also that approximately 170 million people are infected with hepatitis C virus (HCV) and about 130 million are carriers and three to four million persons are newly infected each year and more than 350,000 people estimated to die from hepatitis C-related liver diseases each year worldwide [7]. In the industrialized world, occupational surveillance assesses and monitors the health hazards related to blood borne pathogens and prevention measures reduce the risk of transmission. In contrast, in developing countries, exposure and health impacts are rarely monitored and much remains to be done to protect health care workers (HCWs) from such risks that cause infections, illness, disability and death that may in turn impact on the quality of health care [8].

Aim of the Study: The aim of this study was to fill the information gap on the prevalence of hepatitis B and C virus infection among public health center cleaners because this type of studies are limited in our country Ethiopia. In addition it can be help health clinicians to consider hepatitis viruses' in general patient management.

More over this study serves as one important input for Ethiopian health planners and care providers for designing control and prevention strategy among the study group; and can also used as a growing source of evidence for the control of hepatitis viruses.

MATERIALS AND METHODS

Study Design and Area: A cross-sectional study was conducted at selected public health centers in Addis Ababa Ethiopia. A total of 33 public health centers were included from all sub cities and they were selected randomly based on parts per size sampling method and of having almost 50% chance to make representative in the study area.

Study Period: The study was conducted from May 1, 2014 to September 20, 2014.

Study Subjects: This cross-sectional hospital-based study was conducted among selected health centers cleaners who fulfiled the inclusion criteria.

Sampling: The samples size for the study was determined by assuming the prevalence of HBSAg in health centers cleaners to be 6.3% at 95% Confidence Interval and 3% margin of error. Accordingly the calculated final sample size was found to be 252. Probability sampling technique was applied to select the public health centers. The thirty three health centers were selected randomly based on parts per size (PPS) sampling method and the study participants were selected using convenient sampling technique.

Measurement and Data Collection

Data Collection Tools: Participant's Socio demographic variables, HBV vaccination status, knowledge of infectious agents, provision of personal protective equipments and risk factors of HBV and HCV was carefully collected using pre-tested standard questionnaire to obtain relevant information.

Specimen Collection and Laboratory Investigation: After obtaining informed consent, 5 ml of venous blood was drawn under aseptic conditions from 252 public health center cleaners and by experienced laboratory personnel. Samples from 252 study participants were collected, allowed to clot, centrifuged at 300 RPM for 10 minutes at room temperature. All serum samples were transported to Arsho medical Laboratory using cold box and placed at -70°C using Eppendorf tubes until investigation was done. Then sera were screened for hepatitis B surface antigen (HBsAg) and antibody to hepatitis C virus (anti-HCV) using Enzyme Linked Immunosorbent Assay (ELISA) (Hepanostika test kit; Biomerieux, Boxtel, the Netherlands). Results greater than or equal to the cut off value and the percent neutralization is > 50%, the sample is considered confirmed positive for both HBsAg and HCV and results less than the cut off value are considered negative for both.

Data Management and Analysis: Data was entered into Microsoft Excel sheets and exported to STAT software version 12 for analysis. The data was summarized and organized using graphs, tables and texts. The chi square was used to see the association. Odds ratios (OR) and their 95% confidence intervals (CI) were estimated using bivariate and multivariate logistic regression analysis to identify possible explanatory variables on occurrence of HBV and HCV. The result at p-value ≤ 0.05 was considered as statistically significant.

Ethical Clearance: The study was approved by the department research ethical review committee of medical Laboratory Sciences, college of health sciences, Addis Ababa University and Addis Ababa Regional Health Bureau. Informed consent was obtained from each study subjects prior to interview and specimen collection; and the purpose of the study was explained to the respondents. No personal identifier was used and confidentiality of the information obtained was assured and privacy of the respondents was maintained. The study did not have any harm except the minim pain associated with blood drawing. Study participants with positive results were communicated with health service providers (clinicians) of the public health centers.

RESULTS

Socio-demographic Characteristics of the Study Participants: From 33 public health centers, a total of 252 cleaners were participated for interview and gave blood samples. Complete information was obtained from all study participants and included in analysis. Almost all 243 (96.4%) of the PHCCs were females (female to male ratio = 27:1). Most of the participants, 116(46.0%)) were between the age of 18 and 28 years ranging from 19 to 53 years. The mean (±SD) age was 30.5(±7.7) years. The mean services year as public health center cleaner was 2.2 years. The majority 133(52.8) of them were married.

Risk Factors to HBV and HCV among Cleaners: From the study participants 150(59.5%) reported that they had no history of hospital admission and needles stick injury ever; whereas 138 (54.8%) reported that they had a history of needle stick injury one year before this interview and 139 (55.2%) had a history of ear piercing. 17 (6.8%) of them were immunized against hepatitis B virus and 122(48.4%) of them took training on medical waste management practice and 193(76.6%) knew about color-coding segregation of medical waste. 131(52.0%) had a habit of washing injury site with soap and water during needle stick injury and 121(48.0%) do not.

Among 252 PHCCs tested, HBV and HCV was detected in 9 (3.57%) and 4 (1.59%) respectively. Almost two times differences were observed in the detection rates of HBV when compared with HCV. The magnitude of HBV by specific age group was highest in the age group of 29-39 years and was zero in the age group of 51-61years. The prevalence of anti-HCV Ab. in the age group 18-28 was 2.6% and that of 40-50 was 2.9% whereas in the age groups 29-39 and 51-61 were 0.0% (Figure 1)

Table 1: Socio-demographic characteristics of public health center cleaners (PHCCs) at Addis Ababa, Ethiopia 2015 (N=252)

Socio-demographic characteristics	No (%)
Sex	
Male	9 (3.6)
Female	243 (96.4)
Age	
18-28	116 (46.0)
29-39	98 (38.9)
40-50	34 (13.5)
50-61	4 (1.6)
Marital status	
Single	58 (23.0)
Married	133 (52.8)
Widowed	27 (10.7)
Divorced	34 (13.5)
Education Level	
no formal education at all	4 (1.6)
primary education	113 (44.8)
secondary education	107 (42.5)
college level	28 (11.1)
work experience	
0-5 yrs	73 (28.9)
6-10 yrs	89 (35.3)
11-15 yrs	52 (20.6)
above 16 yrs	38 (15.1)

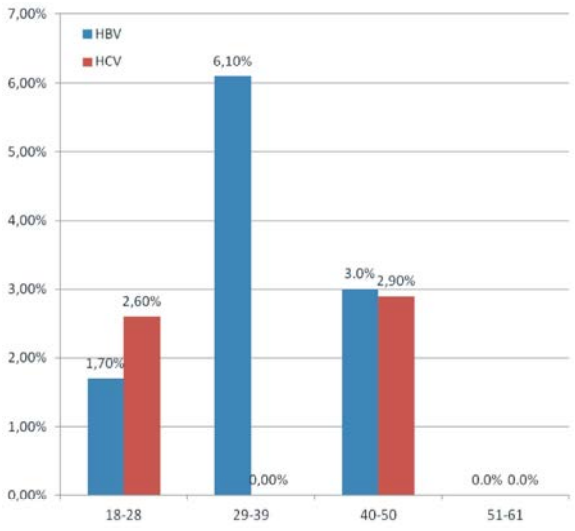

Fig. 1: Magnitude and Distribution of HBV and HCV infection by age of public health center cleaners (PHCCs) at Addis Ababa, Ethiopia 2015.

HBV and HCV Seroprevalence of Public Health Center Cleaners (PHCCs): The determination of hepatitis B prevalence among public health center cleaners was made by detecting HbsAg in serum and the assessment of

Table 2: Risk Factors to HBV and HCV of public health center cleaners (PHCCs) at Addis Ababa, Ethiopia 2015

Risk factors	Yes (%)	No (%)		
Multiple sexual partners	88 (34.9)	164 (65.1)		
Blood contact	217(86.1)	35(13.9)		
Needles stick injury ever	150(59.5)	102(40.5)		
Needles stick injury for the last one year	138(54.8)	114(45.2)		
Sharp injury ever	78(30.95)	174(69.05)		
Sharp injury for the last one year	76(30.2)	176(69.8)		
Ear piercing	139(55.2)	113(44.8)		
Blood transfusion	75(29.8)	177(70.2)		
Hospital admission	150(59.5)	102(40.5)		
Have you taken training on medical waste	122(48.4)	130(51.6)		
Do you know color-coding segregation of medical waste	193(76.6)	59(34.4)		
Did wash injury site with soap and water	131(52)	121(48)		
History of vaccine for HBV	One times	Two times	Three times	Not vaccinated
	0(0)	0(0)	17(6.8)	235(93.2)

Table 3: Multivariate analysis on seemingly significant predictors to HBV and HCV in bivariate analysis of public health centers at Addis Ababa, Ethiopia 2015 (N=252)

Characteristics	Crud OR(95% CI)	P-value	Adjusted OR(95% CI)	P-value
History of liver disease		0.034		0.064
No	1		1	
Yes	15.06(1.23-183.80)		11.47 (0.87-151.67)	
Marital status		0.394		0.383
Others	1		1	
Single	1.78(0.47-6.73)		1.79(0.49-6.59)	

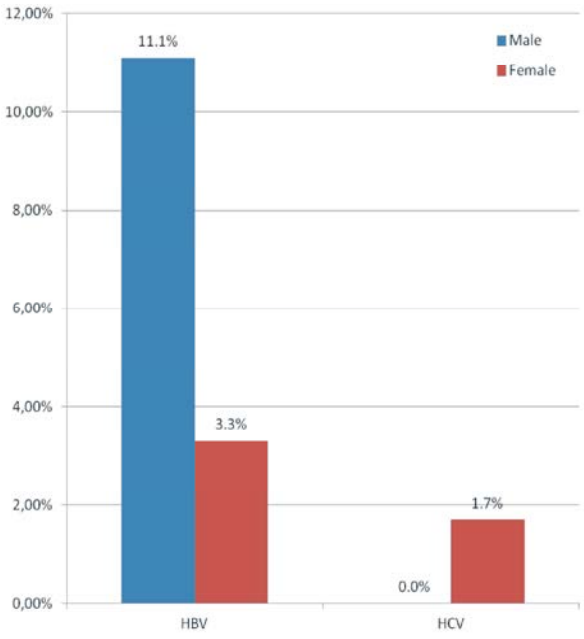

Fig. 2: Magnitude and Distribution of HBV and HCV infection by sex of public health center cleaners (PHCCs) at Addis Ababa, Ethiopia 2015.

hepatitis C prevalence among public health center cleaners was made by detecting anti-HCV Ab. The presence of this marker was taken as measure of infection. Among 9 male study participants 1(11.1%) individual were positive and from 243 female study participants 8(3.3%) of them were positive (Figure 2).

Risk Factors Associated with HBV and HCV: Bivariate logistic regression was used to identify possible explanatory (independent) variables. As a result, marital status (P=0.05) was significantly associated with the occurrence of HCV. In bivariate analysis of the variables for independent predictors of HBV in PHCCs, liver disease (P=0.005) showed significant effect.

Multivariate Analysis on Seemingly Significant Predictors of HBV and HCV: Multiple logistic regression analysis was applied for controlling confounders and for evaluating the effects of risk variables on HBV and HCV infection among studied group. Seemingly significant values ($P \leq 0.05$) on associated risk factors were taken to multivariate logistic regression. None of them were significantly associated with the occurrence of HBV and HCV (Table 3).

DISCUSSION

Hepatitis B and Hepatitis C viral infections are among the most prevalent infectious diseases in humans worldwide. Both infections are associated with a broad range of clinical presentations ranging from acute or fulminant hepatitis to chronic infection that may be clinically asymptomatic or may progress to chronic hepatitis and liver cirrhosis [4]. The present study has found that 3.57% and 1.59% of cleaners had HBV and HCV respectively.

Test results show a low frequency of HCV antibody in PHCCs at Addis Ababa which is in accordance with similar international studies, confirming the fact that the possibility of developing HCV infection in PHCCs is 10 times smaller than the possible infection with HBV with an average exposure risk [9]. Lower and higher prevalence rates were also detected from different parts of the world. Lower prevalence found in Bangkok, Thailand, with reported rate of (2.02%) HBV [10]. In Karachi Pakistan, higher rate of (18.8%) for HBV and (8.5%) for HCV were reported, respectively. This difference might be due to small sample size [11].

The present study showed highest prevalence rate of HBsAg (3.57%) compared to prevalence rate of HCV (1.59%). On the other hand results from Lybia revealed highest prevalence of HCV (2.7%) when compared to a 2.3% of HBV prevalence [12]. In our country, previous population hospital and health center based studies had reported medium to high endemicity of HBV and HCV infection [2, 4, 6, 13- 17]. The prevalence of HCV among the general population in Addis Ababa was 0.9% and among adults over 15 years of age was 1.3% [14].

But a study from Gondar showed a prevalence of 6% for HBV and 1.0% for HCV among medical waste handlers and another study from Addis Ababa revealed 6.3% prevalence for HBV. The difference might be due to methodological and sample size differences [4]. WHO has estimated that exposure to sharps in the workplace accounts for 40 % of infection with HBV and HCV. More than 100,000 needles stick and sharps injuries (NSSIs), contamination of pre-existing skin lesions or splash inoculation to the eyes, nose or mucous membranes were reported in United kingdom hospitals annually posing a considerable risk for the transmission of more than 20 kinds of blood-borne pathogens, including hepatitis B virus and hepatitis C virus [18].

In our study we found 59.5% and 30.95% public health center cleaners to have needle stick and sharp injuries respectively while handling medical wastes. This finding is inconsistent with findings on global burden of needle stick injuries among healthcare workers. The reason might be improper collection, transporting, disposal of needles and sharp objects [19].

81.1% and 41.3% of our study participants were exposed to blood and other body fluid splash in different parts of their body respectively. This finding was comparable to the study done in Khartoum, Sudan [3]. Almost all public health center cleaners (94.8%) knew that PPE can protect them from infection, though 87.1% did not perform regular washing of buckets, wearing gloves and masks that had 6.3% hepatitis viruses' positivity when compared to those individual who regularly used PPE 3.2% and 0.9% positivity for HBV and HCV respectively.

More than 76.6% of them knew about color-coding segregation of medical wastes while performing their duties but only 65.1% followed color-coding segregation. This may be the result of lack of training, as more than 50% of PHCCs were not trained how to handle medical wastes. This was comparable with a study in Khartoum, Sudan which found the level of occupational safety is below standard requirements, as protective equipment and clothing were not available for most workers and only 15.1% of the workers were trained in handling medical wastes.

CONCLUSION

The prevalence of hepatitis B virus is higher than hepatitis C virus. The presence of a higher (3.57%) and (1.59%) hepatitis B virus and hepatitis C viruses prevalence respectively when compared to the national prevalence (0.9%) rate are due to occupational related risks like: collection, transportation, disposal with inappropriate containers, inadequate supply of PPE, needle stick and sharp injuries, blood and body fluid splashes and poor vaccination status. Therefore, Occupational exposure prevention should be the primary strategy to reduce the risk of blood borne pathogens.

Consent: All authors declare that 'written informed consent was obtained from the patient for publication of this research article.

Competing Interests: There was no conflict of interest among the authors or with any other parties.

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