



RESEARCH ARTICLE

PREVALENCE OF HBV AND HCV; AND THEIR ASSOCIATED RISK FACTORS AMONG PUBLIC HEALTH CENTER CLEANERS AT SELECTED PUBLIC HEALTH CENTERS IN SANA'A CITY-YEMEN

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Abstract

Objective: 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. In the industrialized world, occupational surveillance is performed to assess and monitor health hazards related to blood borne pathogens. In contrast, in developing countries as Yemen, exposure and health impacts are rarely monitored and much remains to be done to protect PHCCs. The objective of this study was to determine the prevalence of HBV and HCV and their potential risk factors among PHCCs.

Methods: A cross sectional prospective study was conducted among 388 PHCCs. Data was collected using pre-tested and structured questions. Venous blood was collected and the sera were tested for HBV surface antigen and anti-hepatitis C antibodies using enzyme-linked immune sorbent assay technique. The data were analysis by EPI-Info. Chi square and Odds ratio tests were used to assess the association of risk factors with HBV and HCV positivity.

Results: Results revealed that among the total 388 PHCCs examined, HBV and HCV were detected in 32 (8.2%), and 4 (1.03%) of them respectively. There was significant risk factors of hepatitis viruses with age group 20-24 years (OR=2.8), exposure to patients blood (OR=3), accidental stick of used needles (OR=2.3), sharp injury (OR=5.6), history of blood transfusion (OR=2.5), and hospital admission (OR=2.7). Also significant protected roles for HBV vaccine was found with infection.

Conclusion: In conclusion high prevalence rates of HBV and HCV occurred in PHCCs. Unfortunately; all workers did not take training on medical waste and few workers use protective measures consistently as vaccination. There is needed to make vaccination of health care workers against HBV infection a firm policy and ensure complete and consistent adherence to work standard safety measures.

Keywords: HBV, HCV prevalence, risk factors, Public Health Center Cleaners (PHCCS), Yemen.

INTRODUCTION

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^{1,2}. 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 worldwide³. 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 as Yemen, 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 care⁴. The aim of this study was to fill the information gap on the prevalence of HBV and HCV infection among PHCCs because these types of studies are absent or at least limited in Yemen. 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 Yemen 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.

SUBJECTS AND METHODS

Study Design and Area

A cross-sectional study was conducted at selected public health hospitals and centers in Sana'a city. A total of 33 public hospitals and health centers were included from all districts of Sana'a city. They 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 to December, 2015.

Sampling

The samples size for the study was determined prevalence of HBV infection among people at high risk for infection⁵. By assuming the prevalence of HBs Ag 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 388. Probability sampling technique was applied to select the public hospitals and health centers. The thirty three hospitals and health centers were selected randomly based on parts per size (PPS) sampling method and the study participants were selected using convenient sampling technique.

Data Collection

Participant's Socio demographic variables, HBV vaccination status, knowledge of infectious agents, provision of personal protective equipments and risk factors of HBV and HCV were 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 388 PHCCs. Then sera were screened for hepatitis B surface antigen (HBsAg) and antibody to hepatitis C virus (anti-HCV) using Enzyme Linked Immunosorbent Assay (ELISA). 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.

Statistical Analysis

To relate possible risk factors for HBV and HCV infection, the data were examined in a case-control study format. For HBV or HCV, persons with evidence of previous or current infection with HBV or HCV positive were matched up with those who were HBV or HCV negative. The chi square was used to see the association Odds ratios (OR) and their 95% confidence intervals (CI). Values (OR, CI, χ^2) were estimated using 2x2 tables to identify possible odds ratio on occurrence of HBV and HCV and their significance. The result at *p*-value 0.05 was considered as statistically significant.

Ethical Consideration

Ethical clearance for the study was taken from the Faculty of Medicine and Health Sciences Research Review Committee. Informed Consent was taken from the volunteers before the collecting specimens.

RESULTS

Almost all 318 (81.9%) of the PHCCs were males (male to female ratio = 4.5:1). Most of the participants, 221 (57%) were between the age of 25 and 29 years ranging from 20 to 51 years. The mean (\pm SD) age was 26.8(\pm 3.3) years (Table 1).

Table 1: The age and sex distribution of PHCCS at Sana'a city tested for HBV and HCV infections.

Age groups	Male		Female		Total	
	No	%	No	%	No	%
20 -24 years	80	25.2	14	20	94	24.2
25-29 years	185	58.2	36	51.5	221	57
30- 34 years	46	14.5	19	27.1	65	16.7
<34 years	7	2.2	1	1.4	8	2.1
Total	318	81.9	70	18.1	388	100
Mean	26.7 years		27.4 years		26.8 years	
SD	3.5 years		2.8 years		3.3 years	
Median	27 years		28 years		27 years	
Mode	27 years		28 years		28 years	
Min	20 years		22 years		20 years	
Max	51 years		32 years		51 years	

The mean services year as public health center cleaner was 4.2 years. Most of PHCCs tested, their work experience was in 6-10 years (51%) (Table 2). Among 388 PHCCs tested, HBV and HCV were detected in 32 (8.2%) and 4 (1.03%) respectively. Almost 8 times differences were observed in the detection rates of HBV when compared with HCV (Table 3).

Risk Factors to HBV and HCV

From the study participants 68.8% reported that they had history of exposure to patient blood, 69.6% to needles stick injury ever; whereas 56.9% reported that

they had a history of needle stick injury one year before this interview.

Table 2: The work experience of PHCCS at Sana'a city tested for HBV and HCV infections.

Work experience	No	%
0 - 5 years	114	29.4
6 – 10 years	198	51
11-15 years	42	10.8
Above 16 years	34	8.8

Total 42.2% of PHCCs reported that they had a history of sharp injury ever; whereas 31.7% reported that they had a history of sharp injury one year before this interview. Total 8.2% had history of blood transfusion, 9.5% history of cupping (Table 4). Only 8 (2.1%) of them were immunized against hepatitis B virus and no one (0%) of them took training on medical waste management practice and 0 (0%) knew about color coding segregation of medical waste.

Table 3: The positive result of HBV, and HCV among different sexes of PHCCS at Sana'a city.

Viruses	Male n=318		Female n=70		Total n=388	
	No	%	No	%	No	%
HBV	28	8.8	4	5.7	32	8.2
HCV	2	0.6	2	2.9	4	1.03
Total	30		6	8.6	36	

201(51.8%) had a habit of washing injury site with soap and water during injury (Table 4).

Associated Odds ratio of HBV and HCV

There were no significant differences in the risk factors of HBV and HCV between male and female workers. In respect of age groups, there was significant risk factors of HBV and HCV with age group 20-24 years with OR=2.8, CI=1.4-5.7, $p=0.02$ (Table 5). In respect of risk factors, there was significant risk factors of HBV and HCV with exposure to patients blood (OR=3, CI=1.1-8, $p=0.01$), accidental stick of used needles (OR=2.3, CI=1.0-5.7, $p=0.05$), sharp injury (OR=5.6, CI=2.1-12.5, $p<0.001$), history of blood transfusion (OR=2.5, CI=1.0-6.5, $p=0.05$), and hospital admission (OR=5.6, CI=1.2-6.2, $p=0.01$). Also protected roles for HBV vaccine and wash injury site with soap and water after accidental needle stick or sharp injury from infection were found (Table 6).

Table 4: The risk factors to HBV, and HCV of PHCCS at Sana'a city.

Risk factors	Yes		No	
	No	%	No	%
Blood contact	267	68.8	121	31.2
Needles stick injury ever	270	69.6	68	30.4
Needles stick injury for the last year	221	56.9	167	43.1
Sharp injury ever	164	42.2	224	57.8
Sharp injury for the last year	123	31.7	265	68.3
Blood transfusion	32	8.2	356	91.8
Cupping	37	9.5	351	90.5
Hospital admission	47	12.1	341	87.9
Have you taken training on medical waste?	0	0	388	100
Do you know color-coding segregation of medical waste?	0	0	388	100
Did wash injury site with soap and water?	201	51.8	187	48.2
History of vaccine for HBV	8	2.1	380	97.9

Table 5: The associated risk factors of HBV and HCV with different sex and age groups for PHCCS at Sana'a city.

Characters	HBV and HCV positive cases (n = 36)		OR	CI	χ^2	p
	No.	%				
Sex	30	9.4	1.1	0.5-2.7	0.05	0.8
Male (n= 318)						
Female (n= 70)	6	5.7	0.9	0.3-2.2	0.05	0.8
Age groups						
20 -24 years (n=94)	16	17	2.8	1.4-5.7	8.8	0.002
25-29 years (n=222)	18	8.1	0.7	0.3-1.4	0.84	0.35
30-34 years (n=66)	1	1.5	0.12	0.01-0.9	5.7	0.01
≥ 35 years (n=8)	1	12.5	1.4	0.16-11.9	0.1	0.75
Total n=388	36	9.3				

DISCUSSION

HBV infection and HCV infection are among the commonest occupational risks healthcare workers including hospital cleaning staffs. The infections are acquired in the hospital setting via needle prick injuries from contaminated needles, eye contact of infected body fluids or from contact of infected body fluids with broken skin⁶. The present study has found that 8.2% and 1.03% of cleaners had HBV and HCV respectively. Test results show a low frequency of HCV antibody in PHCCs at Sana'a city, 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 risk⁷. Lower and higher prevalence rates of HBV and HCV among PHCCs were also detected from different parts of the world. Lower prevalence was found in Thailand and Ethiopia with reported rates of 2.02% and 3.57% for HBV respectively^{8,9}. Also current results for HBV and HCV were lower than that of Pakistan in which a higher rate of (18.8%) for HBV and (8.5%) for HCV were reported among PHCCs, respectively¹⁰. The higher prevalence of HBV than HCV in current study might reflect the prevalence of these viruses among the general population in Sana'a city in which HBV and HCV were estimated to be 4% and 0.5%

respectively¹¹. But a study from Sana'a city among Dental workers showed that the prevalence of HBV and HCV were 18% and 5% respectively higher than present study among PHCCs¹². The difference might be due to methodological and sample size differences⁵. 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 virus¹³.

Table 6: The associated risk factors of HBV, and HCV for PHCCS at Sana'a city, Yemen.

Risk factors	HBV+HCV positive cases (n = 36)		OR	CI	χ^2	P
	No.	%				
	Blood contact n=267	31				
Needles stick injury ever n=270	30	11.1	2.3	1.0-5.7	3.9	0.05
Needles stick injury for the last year n=221	27	12.2	2.4	1.1-5.3	5.2	0.02
Sharp injury ever n=164	28	17	5.6	2.4-12.5	20	<0.001
Sharp injury for the last year n=123	26	21.1	6.8	3.1-14.7	30	<0.001
Blood transfusion n=32	6	18.8	2.5	1.0-6.5	3.8	0.05
Cupping n=37	4	10.8	1.2	0.4-3.6	0.11	0.73
Hospital admission n=47	9	19.1	2.7	1.2-6.2	6.2	0.01
Did wash injury site with soap and water? n=201	19	9.4	0.9	0.4-1.8	0.04	0.83
Irregular use of PPE n=350	34	9.7	1.9	0.4-8.3	0.8	0.3
Regular use of PPE n=38		5.2	0.5	0.1-2.2	0.8	0.3
History of vaccine for HBV n=8	0	0	undefined		0.8	0.36

In current study it was found that 69.8% and 42.2% PHCCs 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 objects¹⁴. About 68.8% of current study participants were exposed to blood and other body fluid splash in different parts of their body. This finding was comparable to the study done in Ethiopia⁹ and Sudan¹⁵. Almost all public health center cleaners (94.8%) knew that PPE can protect them from infection, though 90.1% did not perform regular washing of buckets, wearing gloves and masks that had 9.7% hepatitis viruses' positivity when compared to those individual who regularly used PPE 5.2% positivity for hepatitis viruses. No one (0%) of them knew about color-coding segregation of medical wastes which not performed in all hospitals and centers included in this study. This may be the result of lack of training, as 100% of PHCCs were not trained how to handle medical wastes. This was similar to situations in Ethiopia and 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^{9, 15}.

When we considered the risk factors of hepatitis viruses among current study group, there were significant risk factors with accidental needles stick, and sharp injury (Table 6). The chances of contracting HBV after an HBV-contaminated accidental needle stick average one in 20 while chance of contracting HCV after an accidental needle stick is 3.5 in 100¹⁶. Also there was a significant risk factor of hepatitis viruses occurred with history of blood transfusion and

hospital admission (Table 6). This high risk for blood transfusion could be explained by that small proportion of HBV infected donor's circlet HBV in their blood at levels to low to be detected by currently available methods, in Yemen in blood banks. This result confirms the important of introduction of Genetic screening, which is effectively going to exclude those donors who are persistent, low level carriers, and those in the window period of their acute infection¹⁷.

CONCLUSIONS

The prevalence of hepatitis B virus is higher than hepatitis C virus. The presence of a higher (8.2%) and (1.03%) hepatitis B virus and hepatitis C viruses prevalence respectively when compared to the national prevalence (4% and 0.5%) 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 among PHCCs in Sana'a city. Also there is needed to make vaccination of health care workers against HBV infection a firm policy and ensure complete and consistent adherence to work standard safety measures.

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AUTHOR'S CONTRIBUTION

This research work is part of A M.Sc thesis. **Al-Marrani WHM:** conducted the laboratory and field works; and wrote up the thesis. **Al-Shamahy HA:** supervised the laboratory and field works, revised and edited the thesis draft and the manuscript.

DATA AVAILABILITY

The data and material are available from the corresponding author on reasonable request.

CONFLICT OF INTEREST

No conflict of interest associated with this work.

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