

HEPATITIS B AND C VIRUS INFECTION AMONG HEALTH CARE WORKERS IN GENERAL SURGERY DEPARTMENT, ASSIUT UNIVERSITY HOSPITALS

By

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Abstract:

Introduction: Approximately 30% of the world's population has serologic evidence of current or past HBV infection. Middle East has an intermediate level of HBV endemicity (2- 7%).It is estimated that 3% of the global population have chronic HCV infection. The prevalence of Anti-HCV in Egypt was 14 % in 2010. More than 30 dangerous blood-borne pathogens are transmitted by contaminated needles, but those of primary significance to healthcare workers (HCWs) are hepatitis B virus, hepatitis C virus and human immunodeficiency virus. Needle stick and sharps injuries (NSSIs) have been recognized as one of the most serious occupational hazards among HCWs.

Aim of Work: To study the frequency and risk factors of hepatitis B & C virus infection among health care workers in general surgery department, Assiut University Hospitals.

Materials and Methods: A Cross-sectional study was carried out among HCWs in general surgery department, Assiut University Hospitals. This study included 215 HCWs, of them 21 refused to be subjected to serological examination. The instrument used was a structured interview questionnaire. Blood samples were taken from HCWs to screen for Anti-HCV, HBsAg, anti-HBc and anti-HBs. **Results:** 5.2% of HCWs were Anti HCV positive, 3.1% were HBs Ag positive, 28.9% were Anti HBc positive, 55.7% were Anti HBs positive and 32.5% of HCWs were negative. Hepatitis virus infection was statistically significant among older age group, nurses and technicians and with long working duration. **Conclusion and Recommendations:** to improve hepatitis B vaccination coverage among HCWs, avoid needle stick and sharps injuries (NSSIs) and to improve the reporting system.

Key words: Viral Hepatitis, Health Care Workers, General Surgery, Anti-HCV, HBsAg, anti-HBc and anti-HBs.

Introduction

Approximately 30% of the world's population, or about 2 billion persons, have serologic evidence of current or past HBV infection. WHO estimates that around 4.3 million persons are infected with HBV in the Eastern Mediterranean Region each year (WHO, 2009). Middle East has an intermediate level of HBV endemicity (2- 7%) (Da Villa and Sepe, 1999).

It is estimated that 3% of the global population (approximately 170 million people) have chronic HCV infection and that 3–4 million people are newly infected each year. WHO estimates that around 800 000 persons are infected with HCV in the Eastern Mediterranean Region each year (WHO, 2009). The prevalence of Anti-HCV in Egypt was 14 %, about 11 826 360 persons infected with HCV in 2010 (Lavanchy et al., 2011). Another study reported that the prevalence of antibodies against HCV in various regions in Egypt ranged from 6 to 28 % (mean 22 %) (Lauer and Walker, 2001). Anti-HCV seroprevalence rates among blood donors were 0.5%, while higher rates had been observed among hemodialysis patients (20%) and hemophilia patients (60% to 90%) (Alter and Mast, 1994).

More than 30 dangerous blood-borne pathogens are transmitted by contaminated needles, but those of primary significance to HCWs are hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) (Kebede and Molla, 2012). World Health Organization estimated that of 35 million HCWs worldwide, approximately 3 million experienced percutaneous injuries each year and of those injured 70,000, 15,000 and 500 respectively were likely to be infected with HBV, HCV and HIV (WHO, 2003).

Although the majority of these occupational infections occur in developing countries where the prevalence rates of blood borne pathogens and risk of occupational injuries are high (Varghese et al., 2003). Further, the exposure and health impacts are rarely monitored and much remains to be done to protect HCWs from such risks that cause infections, illness, disability and death. These injuries may also impact the quality of health care (Kebede and Molla, 2012).

Needle stick and sharps injuries (NSSIs) have been recognized as one of the most serious occupational hazards

among healthcare workers (HCWs) (Ciesielski and Metler, 2003). Surgeons have been shown to have a four- to eight fold higher incidence of exposure to patient blood compared with internist (Kebede and Molla, 2012). The risk of exposure is greater with increasing volume of blood loss and prolonged length of procedure (Gutmann et al., 1999).

Aim of Work

To study frequency and risk factors of hepatitis B & C virus infection among health care workers in general surgery department, Assiut University Hospitals.

Materials and Methods

Study site and time: The study was conducted in general surgery department, Assiut University Hospitals between June 2013 & December 2013.

Study design: A cross-sectional study was carried out among the target population.

Study population: Total coverage of assistant lecturers, residents, nurses and workers (215 HCWs) in general surgery department, Assiut University Hospitals. Of them 21 refused to be subjected to serological examination.

Study Methods::

1. A structured interview questionnaire.

The data included in the questionnaire were:

- Socio-demographic data: age, sex, occupation and number of working years.
- History of previous needle injury (how many, circumstances, where, when & gloves used during injury, reporting & causes of under-reporting).
- History of previous body fluid exposure (type, amount, area of exposure)
- Risk factors (previous blood transfusion, previous complaint of jaundice, presence of infected partner and vaccination against hepatitis B virus).
- Practicing of infection control (e.g. personal protective equipments used, hand washing and re-capping).

2. Laboratory Investigations

Specimen collection: 3 ml of blood samples were taken from 194 HCWs & serological investigations were done for HBV & HCV using

chemoleucant- Assay to screen for Anti-HCV antibodies, HBV surface antigen (HBsAg), antibody to hepatitis B core antigen (anti-HBc) & antibody to hepatitis B surface antigen (anti-HBs), in top secrecy by using codes.

Pilot study: a pilot study was carried out on 10 HCWs before starting final data collection.

Data Management: Data analysis was done by using SPSS program version 16. Statistical methods were applied including: descriptive statistics,

t-test and chi square test. P-value considered significant if less than 0.05.

Consent:

Informed consent obtained from those who accepted to participate in the study.

Ethical Approval:

Reviewing the proposal was carried out before starting data collection via the Ethical Review Committee of Assiut Faculty of Medicine. The aim of the study was explained to each participant before filling the questionnaire.

Results

Table (1): Demographic characteristics of healthcare workers (HCWs) included in the study in general surgery department, Assiut University Hospitals, 2013

Characteristics	Frequency (%)
Gender:	
• Male	121(56.3)
• Female	94 (43.7)
Age(in years):	
• 20-<30	106 (49.5)
• 30-<40	57 (26.5)
• ≥ 40	52 (24.0)
Mean ± SD	33.19 ± (10.025)
Occupation:	
• Physicians	56 (26.0)
• Nurses/ technicians	114 (53.0)
• Workers	45 (21.0)
Working experience (in years):	
• < 2	26 (12.0)
• 2 -10	93 (43.5)
• 11-20	50 (23.5)
• ≥ 20	46 (21.0)
Mean ± SD	10.3 ± 8.4
Total	215 (100.0)

Table (1) showed that males constituted 56.3% of participants. The mean age was about 33 years. About one quarter (26%) of them were physicians, more than one half (53%) were nurses and technicians and about one fifth (21%) were workers.

Table (2): Results of serological investigations and their interpretation for HCWs included in the study in general surgery department, Assiut University Hospitals, 2013.

Characteristics	Frequency (%)
Negative: (Anti-HCV-ve, HBs-Ag -ve, Anti-HBc -ve, Anti-HBs -ve)	63 (32.5)
Vaccinated: (Anti-HCV-ve, HBs-Ag -ve, Anti-HBc -ve, Anti-HBs +ve)	69 (35.6)
HBV+ve: (Anti-HCV-ve, HBs-Ag +ve, Anti-HBc +ve, Anti-HBs -ve)	6 (3.1)
Previous HBV: (Anti-HCV-ve, HBs-Ag -ve, Anti-HBc +ve, Anti-HBs +ve)	33 (17.0)
Occult HBV(window phase): (Anti-HCV -ve, HBs-Ag -ve, Anti-HBc +ve, Anti-HBs -ve)	13 (6.7)
HCV +ve: (Anti-HCV+ve, HBs-Ag -ve, Anti-HBc -ve, Anti-HBs -ve)	2 (1.0)
HCV+occultHBV: Anti-HCV+ve, HBs-Ag-ve, Anti-HBc +ve, Anti-HBs -ve)	2 (1.0)
HCV+previous HBV: Anti-HCV+ve, HBs-Ag-ve, Anti-HBc +ve, Anti-HBs +ve)	2 (1.0)
HCV + vaccinated: Anti-HCV+ve, HBs-Ag-ve, Anti-HBc -ve, Anti-HBs +ve)	4 (2.1)
Anti-HCV: (HCV-infected)	10 (5.2)
HBs-Ag: (HBV-infected)	6 (3.1)
Anti-HBc: (window phase)	56 (28.9)
Anti-HBs:	108 (55.7)

Table (2) showed results of serological investigation and their interpretation. 32.5% of HCWs were negative, 35.6% were Anti HBs positive (vaccinated), 3.1% were HBs Ag positive, 17 % had previous HB virus infection (anti HBc and anti HBs +ve), 6.7% had occult HBV (window phase)(anti HBc +ve) and 2.1% of HCWs were HCV positive. Collectively, it was found that 5.2% of HCWs were Anti HCV positive, 3.1% were HBs Ag positive, 28.9% were Anti HBc positive and 55.7% were Anti HBs positive.

Table (3): Exposure to Needle Stick and Sharps Injuries (NSSIs) among HCWs included in the study in general surgery department, Assiut University Hospitals, 2013.

Characteristics	Frequency (%)
Exposure history to NSSIs: N=215	
• Exposed	186 (86.5)
• Not exposed	29 (13.5)
Where injury occur: N=186	
• Patient rooms	100(53.8)
• Operation rooms	54 (29.0)
• Others (e.g Emergency department, Intensive care unit(ICU) & clinic)	32 (17.2)
Source of injury: N=186	
• Known	90 (48.4)
• Not known	96 (51.6)
Hepatitis serology among source patient: N=90	
• HCV+ve	25 (27.8)
• HBV+ve	2 (2.2)
• Combined HCV & HBV	3 (3.3)
• Negative	19 (21.1)
• Not tested	41 (45.6)
Injury circumstances: N=186	
• Before use	6 (3.2)
• During use	80 (43.0)
• Recapping	49 (26.3)
• During disposal	51 (27.5)
Tools causing injury: N=186	
• Hollow bore needle	115 (61.9)
• Surgical tool (e.g. Suture needle)	63 (33.8)
• Others (e.g lancet & glass)	8 (4.3)
Reporting:	
• Yes	8 (4.3)
• No	178 (95.7)
Causes of non-reporting: N=178	
• Not a health risk	75 (42.1)
• No trust in infection control unit (ICU)	63 (35.0)
• Fear of infection	40 (22.5)

Table (3) showed that 86.5% of HCWs were exposed to needle stick sharps injuries (NSSIs). Most of NSSIs occurred in patient rooms (53.8%) or in operation rooms (29%). The patient source of injury was known in 48.4% of cases. 27.8% of known sources of injury were hepatitis C positive, 2.2 % were hepatitis B positive and 21% were negative. Most of NSSIs occurred during use (43%) or during recapping of tools causing injury (26.3%). Most tools causing injuries were hollow bore needles (61.9%) and surgical tools (e.g. suture needles) (33.8%). Only 4.3% of injured individuals reported their injuries. The causes of non-reporting were no trust in infection control unit (35.4%) or because they considered these injuries as not a health risk (42.1%).

Table (4): Exposure to blood or body fluids among HCWs included in the study in general surgery department, Assiut University Hospitals, 2013.

Characteristics	Frequency (%)
Exposure history	
• Exposed	146 (68.0)
• Not exposed	69 (32.0)
Type of body fluids involved in the exposure:* N146=	
• Blood or blood products	115 (79.0)
• Vomit	42 (30.0)
• Peritoneal fluid	33 (22.5)
• Urine	33 (22.5)
• Others (e.g Sputum, pleural fluids, saliva)	34 (23.5)
The exposed part:*	
• Intact skin	101 (69.0)
• Covered area	50 (34.0)
• Eyes (conjunctiva)	19 (13.0)
• Non-intact skin	14 (9.5)
• Others(nose& mouth)	9 (6.5)
Site of exposure:#	
• Hands	111 (76.0)
• Chest	31 (21.0)
• Face	29 (20.0)
• Upper limb	16 (11.0)
• Lower limb	7 (5.0)
Cause of exposure to blood and body fluid:	
• Direct patient contact	72 (49.3)
• Specimen container leaked/spilled/broken	32 (21.9)
• Slipped canula	28 (19.1)
• Others (e.g. Ryle insertion)	14 (9.5)
Action after exposure:*	
• Wash hands with water & alcohol	132 (90.5)
• Make investigation	10 (6.8)
• Didn't do any thing	12 (8.2)
Vaccination:	
• Yes	132 (61.4)
• No	83 (38.6)
Doses of hepatitis B vaccine received:	
• One dose	23 (17.4)
• Two doses	27 (20.5)
• ≥ Three doses	82 (62.1)

There may be more than one answer.

Table (4) showed that about two thirds of HCWs (68%) were exposed to blood or body fluids. Most of these fluids were blood or blood products (79%), vomit (30%), peritoneal fluids and urine (22.5% for each). The exposed part were most commonly skin (69%) or covered area (43%). The most common site exposed were hands (76%) or chest (21%) or face (20%).

Table (5): Relationship between infection and characteristics of HCWs included in the study in general surgery department, Assiut University Hospitals, 2013.

Characteristic	Infected No. (R%)	Non-Infected No. (R%)	P-value
Sex: N = 194			
• Male	36 (33.0)	73(67.0)	0.718
• Female	26(30.6)	59 (69.4)	
Mean age (±SD)	39.1 ± (12.2)	30.5 ± (8.0)	0.001*
Occupation: N = 194			
• Physicians	7 (14.3)	42 (85.7)	0.001*
• Nurses / Technicians	32 (32.0)	68 (68.0)	
• Workers	23 (51.1)	22(48.9)	
Working experience (mean ±SD):	14.40± 9.191	8.18± 7.310	0.001*
Exposure to NSSIs: N = 194			
• Exposed	52(31.0)	116(69.0)	0.445
• Not exposed	10 (38.5)	16(61.5)	
Gloves used at time of injury: N=168			
• Double pair of gloves	5 (17.9)	23 (82.1)	0.235
• Single pair of gloves	27 (32.1)	57 (67.9)	
• No glove	20 (35.7)	36 (64.3)	
Body Fluid exposure: N = 194			
• Exposed	42 (31.8)	90 (68.2)	0.951
• Not exposed	20 (32.3)	42 (67.7)	
Action after exposure: N = 132			
• Wash with water & alcohol	41 (33.9)	80 (66.1)	0.092
• Did not wash with water & alcohol	1 (9.1)	10 (90.9)	
Previous jaundice: N = 194			
• Yes	5 (45.5)	6 (54.5)	0.323
• No	57 (31.1)	126 (68.9)	
Partner with HBV or HCV: N = 194			
• Yes	2 (33.3)	4 (67.7)	0.792
• No	60 (31.9)	128 (68.1)	
Previous blood transfusion: N = 194			
• Yes	2 (22.2)	7 (77.8)	0.521
• No	60 (32.4)	125 (67.6)	
Serology of source patient: N = 77			
• Hepatitis patient	6 (23.1)	20(76.9)	0.684
• Negative	5 (35.7)	9 (64.3)	
• Not tested	11 (29.7)	26 (71.3)	
Vaccination (≥ 3doses): N = 194			
• Yes	16 (22.5)	55 (77.5)	0.309
• No	36 (29.3)	87 (70.7)	

*: Statistically Significant

Table (5) showed that hepatitis virus infection was significantly associated with older age ($P < 0.001$), workers as an occupation ($P = 0.001$) and longer working experience ($P = 0.001$).

Table (6): Distribution of HCWs included in the study in general surgery department, Assiut University Hospitals, according to demographic characteristics and results of serological investigations, 2013.

Characteristic	HBV infection No. (R%)	HCV infection No. (R%)	Total No. (C%)	P- Value
Occupation:				
• Doctors	7 (100.0)	0 (0.0)	7 (11.3)	0.187
• Nurses / Technicians	28 (87.5)	4 (12.5)	32 (51.6)	
• Workers	17 (73.9)	6 (26.1)	23 (37.1)	
Sex:				
• Male	30 (83.3)	6 (16.7)	36 (58.1)	1.000*
• Female	22 (84.6)	4 (15.4)	26 (41.9)	
Age (in years)				
• < 40	27 (87.1)	4 (12.9)	31 (50.0)	0.493
• ≥ 40	25 (80.6)	6 (19.4)	31 (50.0)	
Working experience				
• < 11 years	20 (90.9)	2 (9.1)	22 (35.5)	0.471*
• > 11 years	32 (80.0)	8 (20.0)	40 (64.5)	
HB vaccine doses:				
• 0 – 2 doses	36 (87.8) (69.2)	5 (12.2) (50.0)	41 (66.1)	0.284*
• ≥3 doses	16 (76.2) (30.8)	5 (23.8) (50.0)	21 (33.9)	
Anti-HBs level:				
• < 10 -100IU	25 (73.5) (48.1)	9 (26.5) (90.0)	34 (54.8)	0.006
• > 100IU	27 (96.4) (51.9)	1 (3.6) (10.0)	28 (45.2)	
Total (R %)	52 (83.9)	10 (16.1)	62 (100.0)	

*Fisher exact test was used.

Table (6) showed that 30.8% of HBV infected individuals had ≥ 3 doses of hepatitis B vaccine compared with 50% of HCV infected individuals ($P = 0.284$). Higher level (> 100 IU) of anti HBs was significantly higher among HBV infected

individuals (51.9%) than HCV infected individuals (10%) ($P = 0.006$).

Our study showed that previously infected individuals had significantly higher level (81.8%) of Anti HBs than vaccinated individuals (55.1%) ($P = 0.009$).

Discussion

Hepatitis B and C virus infection among HCWs :

In the present study, among 194 HCWs who were subjected to serological examinations, 5.2% were Anti-HCV positive, 3.1% were HBsAg positive, 28.9% were Anti-HBc positive, 55.7% were Anti-HBs positive and 32.5% were negative. (Table 2). It is matched with a serologic survey which was conducted for hepatitis B surface antigen (HBsAg) and antibody (anti-HBs) in 765 employees at 4 hospitals in Cairo, the reported results were 3% HBsAg positive and 28% anti-HBs positive seromarkers (Goldsmith et al., 1989). Another study in Cairo found that, among 597 HCWs who reported a blood exposure, anti-HCV prevalence at screening was 7.2% (Munier et al., 2013).

In Uganda, the reported results of a study conducted on 311 HCWs were: 36.3% negative, 3.5% assumed to be vaccinated, 60.1% had evidence of previous or current infection and 19.3% of infected were of indeterminate status (Anti HBc +ve) (Braka et al., 2006). The prevalence of HBV chronic infection in a study in Syria was 2.8% (Yacoub et al., 2010). In Nigeria among HCWs, HBsAg was positive in 13% and Anti-HBc was positive in 56% (Ola, et al. 2012). In Albania, results of a study conducted on HCWS found that, HBsAg, anti-HBc, anti-HCV and anti-HBs prevalence were 8.1%, 70%, 0.6% and 20%, respectively (Kondili et al., 2007).

Exposure to Needle Stick and Sharps Injuries (NSSIs):

Among 215 HCWs in the present study, 86.5% were exposed to at least one NSSI. (Table 3). During the period of past six months, the reported rates by studies conducted in Egypt (by MOHP) (MOHP, 2004), Ismailia (Egypt) (Khattab et al. ,2008), Syria (Yacoub et al., 2010), and Turkey (Azap et al., 2005) were: 70%, 23.9%, 76.6% and 27% respectively. The reported rates during the period of past 12 months by

studies conducted in Ethiopia (Kebede and Molla, 2012), Ghana (Brewer, 2004) and Germany (Wicker et al., 2008) were, 30, 8%, 32.4% and 31.4% respectively. Portugal study showed that 64.5% had experienced at least one NSSI in the last 5 years (Martinsa et al., 2012). This difference may be due to the number of HCWs in the facility, different work environment, training, culture and availability of resources (Kebede and Molla, 2012).

In the present study there was no association between infection and exposure to NSSIs and that similar to a study conducted in Georgia (Butsashvili, 2012). This may be due to that Egypt had high prevalence of HBV & HCV infection.

The current study found that 26.3% of the study subjects recapped needles after use (Table 3), which is an important cause of NSSIs, which was matched with a study conducted in 98 health care facilities in Egypt showed that approximately 36% of per-cutaneous injuries occur due to two hand recappings (Khattab et al., 2008), 66.6% in Ethiopia (Kebede and Molla, 2012), 76% in Syrian study (Yacoub et al., 2010) and 23% in Georgia (Butsashvili, 2012).

In USA, the Occupational Safety and Health Administration (OSHA) Blood-borne Pathogen Standard prohibits recapping of needles after their use, however, this practice still remains an important source of significant injuries. This may be either due to inadequate training of HCWs or their lack of experience with the correct procedures or lack of access to safety needles that would eliminate the need for recapping. This emphasizes the importance of education, seminars, workshops and safety training program for HCWs to practice precaution behaviors to prevent NSSIs, as recommended by other researchers (Ayranci and Kosgeroglu, 2004). Injuries from hollow-bore needles, especially those used for blood collection or IV catheter insertion are of particular concern. These devices are likely to contain residual blood and are associated with an increased risk for transmission of diseases (CDC, 2008). In the present study, hollow bore and suture needles were responsible for 61.9% and 33.6% of NSSIs respectively.

Reporting of injuries to occupational health departments can reduce rates of injury by identifying risk-prone behaviors and practices.

Under reporting may lead to inaccurate information regarding the overall risk of exposure to pathogens, and full documentation of exposure injuries would guide improvements in prevention (Nagao et al., 2007). On the other hand, an accurate risk assessment can be performed and post exposure prophylaxis provided if necessary (Wilburn and Eijkemans, 2004). In the present study, 95.7% of injuries were not reported to infection control units (Table 3). This is considered a very high rate compared to other study in Egypt in which 74.7% didn't report (Talaat et al., 2004), 28.0% didn't report at Landspítali University hospital (Jelle et al., 2013) and 38.9% in a study in Portugal (Martinsa et al., 2012).

Exposure to blood or body fluids:

In the present study 68% of HCWs were exposed to blood or body fluids (Table 4), nearly similar to a survey conducted in France in 20 hospitals which indicated that 63.3% had blood or body fluid exposure (Tarantola et al., 2006) but exposure was lower in Portugal in which the exposed HCWs were 33% (Martinsa et al., 2012) & 46% of HCWs were exposed in a study in Georgia (Butsashvili, 2012).

In the present study, there was no association between infection and exposure to blood or body fluids. This may be due to high prevalence (90.5%) of hand washing with water and alcohol directly after exposure (Table 4). Another study conducted in Egypt found that 72.6% HCWs wash directly after exposure (Munier et al., 2013). Hand hygiene was found to be the simplest, most effective measure for preventing nosocomial infection (Khattab et al., 2008).

To show the effect of hand washing in prevention of infection, a study conducted in Egypt indicated that the use of disinfectant after OBE (Occupational Blood Exposure) was lower among HCWs who developed viremia than among those who did not (6.7% and 26.3%, respectively; $P=0.04$) (Munier et al., 2013). This is in contrast to a study done in Georgia which found that, there was no significant difference between infection & exposure to body fluids (Butsashvili, 2012).

Demographic characteristics of healthcare workers (HCWs):

In the present study, the mean age of infected individuals was significantly higher than non-infected individuals

(39.1 ± 12.2 versus 30.5 ± 8.0) ($P < 0.001$) (Table 5). This was matched with a study conducted in Ain Shams University Hospitals in Cairo which reported that the proportion of HCV RNA positivity among anti-HCV positive HCWs increased with age (30% vs. 69.6%, among those ≤ 30 years and > 30 years, respectively, $P = 0.01$). However for older HCWs, multiple exposures may contribute in the occurrence of infection (Munier et al. 2013). This is in contrast to a study conducted in Albania which reported that, the highest (11.4%) HBsAg prevalence was observed in the youngest age group (20-30 years of age) (Kondili et al. 2007).

Regarding sex, there was no statistical significant difference between sex & infection ($P = 0.718$) (Table 5). This was matched with HCV viremia in Ain Shams University Hospitals in Cairo that indicated the cumulative incidence of transient viremia was not significantly different between men and women (Munier et al., 2013). In contrast to a study conducted in Georgia, HCV infection status was significantly associated with occupation and gender, as male HCWs were 2.7 times as likely to be infected with HCV

as compared with nursing females. A similar finding was reported by another study in Egypt, where sero-positivity of HBV by sex was greater for males ($P < 0.01$) (Goldsmith et al., 1989).

Regarding occupation, workers had the highest frequency of infection (51.1%), followed by nurses and technicians (32%) and lastly physicians (14.3%), ($P = 0.001$) (Table 5). This is consistent with a study conducted in Egypt which found that combined HBsAg and anti-HBs frequencies by occupational group were: nonprofessional staff (60%), graduated nurses (33%) and physicians (29%) (Goldsmith et al., 1989). In a study conducted in Uganda, it was found that nurse staff had high frequency of HBsAg & Anti-HBc followed by doctors (Braka et al., 2006), in contrast to a study in Nigeria which found that HBV infection was similar in all the different occupational groups of HCWs (Ola et al., 2012).

Regarding working experience, infected individuals had significantly longer working experiences (14.4 ± 9.1 years) than non infected individuals (8.2 ± 7.3) ($P = 0.001$) (Table 5), this may be attributed to long incubation

period of HCV so disease appear late or may be with more frequent exposure develop more risk of infection. A study in Ethiopia showed that participants with working experience of more than 10 years had higher rate of NSSIs (which may help in transmission of infection) compared with those having less than 5 years of experience (WHO, 2009).

Hepatitis B vaccination among HCWs:

Hepatitis B vaccine is 95% effective in preventing HBV infection and its chronic consequences (WHO, 2000). In the present study, we found that 61.4% received HBV vaccine and only 38.1% of HCWs completed three doses of HB vaccine.

Varying figures were reported from different countries of the world regarding complete vaccination (≥ 3 doses) against hepatitis B virus among HCWs, ranging from 68% in Turkey (Azap et al., 2005), 61.5% in India (Setia et al., 2013), 56.1% in Syria (Yacoub et al., 2010), 41.2% in Germany (Schenkel et al., 2008) to 37.9% in Nigeria (Sofola et al., 2007).

In our study there is no association between hepatitis B vaccination (3 doses or more) and development of hepatitis virus infection (Table 5). On the other hand, 14 (16.9%) didn't receive any dose of vaccine but have Anti-HBs level exceeded 100 IU/L, this may be present due to previous infection. A similar finding was reported by a study in Syria where 31 (16.5%) HCWs had never been vaccinated and have detectable anti-HBs titers, positive anti-HBc antibodies (Yacoub et al., 2010).

In the present study, there was no association between vaccination & infection, this may be due to that Anti-HBs level was insufficient as shown before. Out of 52 HBV infected individuals, 16 (30.8%) received ≥ 3 doses of HB vaccine (Table 6). This may indicate that HCWs may need more booster doses as they are in higher risk than other population & they recommended to make Anti-HBs level after vaccination to ensure that it give good response. Also infection may be present before vaccine administration.

Conclusion and Recommendations

Based on the results of the present study, we can conclude that:

- The frequency of hepatitis B and C virus infection among health care workers (HCWs) in general surgery department, Assiut University Hospitals is high,
- Hepatitis B vaccination among HCWs is low,
- Exposure to NSSIs, blood and body fluids of the patients is high and
- Reporting of NSSIs to Infection Control Unit is low.

Therefore, we recommend:

- Make serological profile for every HCW for HBV & HCV before employment, and regular check up every 6 months,
- Total coverage of all susceptible HCWs by hepatitis B vaccine (\geq 3doses) and to detect Anti HBs level after vaccination by 4 months,
- Avoid NSSIs and exposure to blood and body fluids of the patients,
- Reporting system should be encouraged and improved. Availability of safety needles, protective equipments (e.g. gloves), seminars, education, workshops and safety training programs for HCWs play an important role

in the accomplishment of these recommendations.

Conflict of interests

Authors have declared that no conflict of interests exists.

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