

OCCUPATIONAL RISK OF TRANSMISSION OF HEPATITIS B AND HEPATITIS C INFECTION TO HEALTH CARE WORKERS IN EL-MINIA UNIVERSITY HOSPITALS

By

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Abstract:

Background: Health care workers (HCWs) may increase chance of acquiring hepatitis B (HBV) and hepatitis C (HCV) infections through occupational exposure.

Aim of the study: The prevalence of markers for HBV and HCV were studied among HCWs at El-Minia University Hospitals over a 24 months period starting from Jan.2008.

Subjects and methods: The study consisted of wide survey of all HCWs in direct contact with blood from different hospital departments using standardized questionnaire. Blood samples of 10 ml of venous blood were tested for HBV and HCV antigens in 180 exposed HCWs and 181 controls.

Results: The study showed a total incidence of HBV antigens of 7.5% in male exposed HCWs and 6.0% in female exposed HCWs compared to 2.6 % in male controls and 2.8% in female controls. As regard HCV markers, the total incidence in HCWs showed 3.7% in male and 5% in female exposed HCWs compared to 1.3% in male controls and 1.9% in female controls. HCV showed higher incidence of seropositivity in medical staff working in dialysis units and operative rooms.

Conclusion: The study showed that the risk of transmission of HBV and HCV infections to HCWs could be due to the lack of knowledge of hazards and ignorance of protection protocols. Vaccination of exposed HCWs to HBV and enforcing quality improvement

projects and preventive programs will reduce the incidence of occupational exposure.

Key words: Hepatitis B and Hepatitis C, Occupational exposure, Health care workers, El-Minia University Hospitals

Introduction:

Health care workers (HCWs) are directly at risk of transmission of blood borne pathogens through their handling of contaminated body fluids (1). The development of sensitive serological tests over the past two decades has revealed that the main risk of hepatitis among hospital staff is from infection with hepatitis B and hepatitis C viruses (2). Recent reports, have revealed a high prevalence of anti-HCV in persons at high risk of exposure to blood, namely intravenous drug abusers and patients on hemodialysis (3,4,5).

Operating rooms present special challenges in reducing the risk & number of sharp injuries and blood borne pathogen exposure (6). HCWs in developing countries have to deal with the combination of two important issues that amplify their risk, first, the actual risk of transmission is larger; second, inadequate safety measures (7).

In the highlight of many recent reports (8) on the endemicity of HCV in the Egyptian population it was of crucial interest to study the prevalence of markers of infection with HBV and HCV among

HCWs in El-Minia University hospitals and try to assess the rate of transmission of these two viruses in this potentially high risk group. This study will also identify the main factors involved in increasing the risk of occupational transmission and the reasons of the lack of safety precautions and finally the recommendations in order to reduce these hazards in the future.

Subjects and methods:

The study setting is El-Minia University Hospitals which is a tertiary care referral teaching hospital. Data of needle stick injuries, sharps and other traumas reported from January 2008 to January 2010 were analyzed.

Incidents were included if the event involved a percutaneous exposure with a contaminated device. All clean non-used sharps injuries were excluded as they pose almost no risk of transmission. As a part, of the infection control project conducted in our hospital, number; d-026, Higher Education Enhanced Project fund (HEEPF).

As per hospital policy, all incidents of sharp injuries as well as blood and body fluids exposures were reported within

24 hours of occurrence. Subsequent to that, the relevant information including time of incidents, its reporting time, nature of accidents, its association with the activity involved such as surgery or recapping, handling of I.V. lines, safety of sharp disposal, compliance of standard precautions, HBV immunization status of recipient and HBs antibody level. In cases where source is known, their antibodies against HCV were checked to eliminate the chance of disease transmission.

The study consisted of wide survey of all HCWs in direct contact with blood. Trained personnel interviewed HCWs using a standardized questionnaire that included information as age, sex, occupational category, period of employment, needle stick or sharp injuries during previous year, lifetime history of acute hepatitis, blood transfusion, surgical intervention and history of dental treatment in the previous 6 months. Participants who were already vaccinated against HBV were excluded from the study. During the period from January 2008 to January 2010, 80 males and 100 females health care workers of age range 23-46 years mean 38 ± 4 , and the controls were 76 males and 105 females of age range 20-50 years, mean 34 ± 6 , selected at random from administrative workers away

from patient contact. Each blood sample of 10 ml of venous blood drawn in plain vacutainers, was allowed to clot at 37°C for 1 hour before being centrifuged and the supernatant was stored at -30°C until tested for HBV markers by commercially available immunosorbant assays ELISA (enzyme linked immunosorbent assay). ELISA; green-cross laboratories, Korea), also all submitted samples were tested for anti-HCV by UBI HCV EIA (Haupauge, NY, USA).

Results:

The demographic characteristics of the health care workers risky to blood borne occupational exposures are shown in table1. The exposed male HCWs were 80 and the exposed females were 100 with a mean age of 38 ± 4 years, the registered nurses constituted the major percentage 90 (50.0%) followed by physicians 65 (36.0%) and technicians 25 (13.9%) as regard the type of occupational injuries shown in table1. Percutaneous injuries constituted 26.7% of which needle injuries were 21.2% and other sharps injuries constituted 10% and mucutaneous injuries constitute 10% and other types of injuries constituted 5.5% as shown in table (1).

Table (1) Occupational blood borne exposure in El-Minia university hospitals (2008-2010)

Variables	Frequency	%
Sex M/F	80/100	
Age	38±4 Years	
Reporting intervals(M)	1-3 Months	
Occupation:		
Physicians	65/180	36.1%
Registered nurses	90/180	50.0%
Technicians	25 /180	13.9%
Types of Exposure:		
Percutaneous	48/180	26.7%
Needles	38/180	21.1%
Others sharps	18/180	10.0%
Mucocutaneous	18/180	10.0%
Others	10/180	5.5%

The incidence of positive cases of HBV marker in physicians ,nurses & technicians was (9.5%) in male exposed physicians and (4.3%) in female exposed physicians (8.7%). As regard nurses the incidence of cases of positive HBV markers was 7.1% in male exposed nurses and it was 6.5% in female exposed nurses as regard technicians the incidence of HBV markers was 6.7% in exposed female technicians while there was no detected positive male technicians for either HBV or HCV; this makes a total incidence of 7.5% in male exposed HCWs and a total of 6.0% in female exposed

HCWs while the total incidence in male controls was 2.6% and in female controls 2.8%.

Anti HCV positivity rate was 1.3% in the male controls and 1.9% in female controls versus 4.8% in male practicing physicians and 4.3% in the female practicing physicians. However Anti HCV positivity rate in practicing nurses was 3.6% in male nurses and 4.8% in female nurses, the total incidence in male exposed HCWs was 3.7% and in female exposed HCWs it was 5% ($p < 0.05$) as shown in table (2).

Table 2: Prevalence of hepatitis B and hepatitis C virus markers in health care workers in El-Minia University Hospitals (2007-2010)

Subjects tested	Sex	Number Tested	HBV markers		HCV markers	
			AntiHBV	%	Anti HCV	%
Physicians	Male	42	4	9.5%	2	4.1%
	Female	23	1	4.3%	1	4.3%
Nurses	Male	28	2	7.1%	1	3.6%
	Female	62	4	6.5%	3	4.8%
Technicians	Male	10	0	0.0%	0	0.0%
	Female	15	1	6.7%	1	6.7%
Total exposed	Male	80	6/80	7.55	3/80	3.7%
Total positive cases	Female	100	6/100	6.0%	5/100	5.0%
			12/168	7.1%	8/172	4.6%*
Controls	Male	76	4/76	5.3%	1/76	1.3%
	Female	105	5/105	4.8%	2/105	1.9%
Total positive cases			9/172	5.2%	3/178	1.6%

Significance is indicated by an * (p-value < 0.05)

As regard the descriptive characteristics of occupational blood exposures, the results in this study showed that the commonest place for exposure to HBV and HCV was in hemodialysis rooms (17.4%) while operative room showed 8.2% positivity for HBV and

5.6% for HCV. emergency department showed 10.7% for HBV and 7.1% for HCV while inpatient wards showed 8% in HBV and 4% in HCV .However in dental clinic showed 5.6% in HBV and HCV as shown in table (3).

Table 3: exposure places and exposed body sites.

Variable	Number tested	HBV	%	HCV	%
Exposure places:					
Inpatient wards	25	2	8.0%	1	4.0%
Operative rooms	73	4	5.5%	2	2.7%
Emergency departments	28	2	7.1%	1	3.6%
Intensive care units	14	1	7.1%	0	0.0%
Hemodialysis rooms	28	2	7.1%	3	0.7%
Dental clinics	18	1	5.6%	1	5.6%

Discussion:

This study provides a preliminary report about occupational risk of transmission of HBV and HCV to HCWs in El-Minia University hospitals. This study also shows that a significant proportion of HCWs remain at risk of blood exposure and hence risk of infection. The report of WHO in 2004 (9) showed that 2.5% of HIV cases and 40% of HBV and HCV cases among HCWs worldwide were the result of occupational exposure. The overall total seropositivity of exposed HCWs in this study showed a significant risk of HBV and HCV compared to controls. Previous results of occupational blood exposures showed that the risk of infection among HCWs is a product of three probabilities: the risk for an exposure, the prevalence of infection in the source patient population and the probability of

transmission attributable to the exposure (10, 11).

The prevalence of infection in HCWs in teaching hospitals, like our university hospitals, varies widely and in a previous report 34% of source patients have antibodies to HCV and 2.3% have HBV antigenemia (12). It has been shown that transmission of HCV occurs after approximately 1.8% of needle punctures involving contaminated blood and is even more common when the source patient has circulating virus detected by polymerase chain reaction (13,14). The risk of transmission of HBV to those susceptible to infection exceeds 30% when the source patient has hepatitis B e antigen (HBe Ag), a marker of high circulating virus titre (15).

In our study percutaneous occupational injuries was 26.7% and needle puncture

injuries was 21.1% and other sharps (scalpel, bogies, scissors, etc.) of about 10% but mucocutaneous injuries contributed 10.0%. These results are similar to that seen in published studies by (Tarantola et al., 2005) and (Talaat et al., 2003), (16,17). In general, percutaneous and needle punctures pose the highest risk for transmission of blood borne pathogens preventing this type of injury must assume the highest priority and recent data has shown that safer needle devices can prevent phlebotomy-associated injuries (18,19). The results of this study showed the highest incidence of occupational exposures to be in hemodialysis units, emergency departments and operating rooms. These results are similar to previous results that showed a highest percentage of occupational exposures in dialysis and emergency departments as it is the site of many invasive bedside procedures and it is clearly a high-risk location for serious blood exposures (20, 21).

Biohazard exposures are often accepted as being a part of the job although the majority of these exposures are preventable. Numerous modifiable and non-modifiable factors place HCWs at risk; the most common are two-handed recapping and the unsafe collection and disposal of sharp wastes. Administrative issues, relying

on senior staff in absence of dedicated phlebotomy and catheter placement teams (22,23).

Ergonomic issues i.e. overcrowding and lack of easy access to sharps disposable and clinical issues i.e. competing priorities in the care critically ill patient that detract from safety standards and proper supervision. From the data in present study and also from previous studies, it is evident that education, ongoing quality improvement projects and preventive programs play a major role in augmentation of knowledge and safe behavior of HCWs (24).

A supervised training especially initial stress year is needed not only to reduce the incidents of occupational exposures but also to improve work performance (25). The introduction of devices safety measures and training in universal precautions is persistent and will reduce incidents among HCWs.

References:

1. Naghavi SH and Sanati KA. (2009): Accidental blood and body fluid exposure among doctors. *Occupational medicine* 59(2):101-106.
2. Dement JM, Pompeii LA , Ostbye T , Epling C, Lipscomb HJ , James T, Jacobs MJ , Jackson G and Thomann W. (2004): Blood and body fluid exposure risks among health care workers: results from the Duke health and safety surveillance system. *A.m. OF Ind. Med.* 46-637-648.

3. Ramsay J, Denny F, Scirotnyak K, Thomas J, Corneliuson E, and Pexton K L. (2009): Identifying nursing hazards in the emergency department :A new approach to nursing job hazard analysis . *Journal of Safety Research*; 55:425-27.
4. Balado V , Floreani A and Vecchio DL. (2002): Occupational risk of blood-borne viruses in healthcare workers ; A 5-year surveillance program . *Infect. Control Hosp Epidemiol*; 23:325-27.
5. Zafar A, Habib F, Hadwani R, Ejaz M, Khowaja K, Khowaja R, and Irfan S (2009): Impact of infection control activities on the rate of needle stick injuries a tertiary care hospital of Pakistan over a period of six years :An observational study *B Mc Infect Dis*;9:78-85.
6. Phillips EK, Owusu-ofori A, Jaggr J. (2007): Blood borne pathogen exposure risk among surgeons in sub-Sharan Africa. *Infect control Hosp Epidemiol* ; 28: 1334-1336.
7. Wicker S, Jung J, Alwinn R, Cottschalk R, Rabenau HF. (2008): Prevalence and prevention of needle stick injuries among health care workers in a German University hospital . *Int Arch Occup Environ Health*; 81:347-354.
8. Micheal W ,Mclaws SM, Kaven N. (2008): Needle stick injuries in a major teaching hospital ,the worthwhile effect of hospital wide replacement of conventional hollow bore needles. *American journal of infection control*; 36; 180-86.
9. Wilburn SQ and Eijkemans G. (2004): Preventing needle stick injuries among healthcare workers, a WHO-ICN collaboration. *Int J Occup Environ Health* ;10:451-56.
10. Gerberding JL. (1995): Management of occupational exposures to blood borne viruses. *N Engl J Med*; 332:441-51.
11. Riddelt LA and Sherrard J. (2000): Blood-borne viruses infection :the occupational risks *Int J Std Aids* :11:632-39.
12. Norsayani MY and Noor Hassin I. (2003): Study on incidence of needle stick injury and factors associated with this problem among medical students. *J. Occup Health* 45,172-178.
13. Sagoe-Mosesc M, Pearson R, Perry J. (2001): Risks to Health care workers in developing countries. *N Engl Med*;345:538-41.
14. Techasathit W, Ratanasuwan W, Sonjai A, Sanngsiriwut K, Anekthananon T and Suwanagool S. (2005): Vaccination against hepatitis B virus :are th medical students sufficiently protected? *J Med Assoc Thai* 88,329-334.
15. Levanchy D. (2004): Hepatitis B Virus epidemiology, disease burden treatment and current and emerging prevention and control measures. *J viral hepatitis* 2004; 11:97-107.
16. Tarantola A, Koumare A, Rachline A, Rachline A, Golliot F, Fleury L and Bouvet E. (2005): A descriptive retrospective study of 567 accidental blood exposure in healthcare workers in three west African countries *J Hospital Infect*;60:276-282.
17. Talaat M, Kandeel A and El-Shoubary W. (2003): Occupational exposure to needle stick injuries and Hepatitis B Vaccination coverage among Healthcare Workers in Egypt. *Am J Infect control*:469-74.
18. Murphy E. (2000): Hepatitis B Vaccination and Healthcare Workers .*Occup Med*;50:383-386.
19. Beekmann SE, Vaughn TE and Mc Coy KD. (2001): Hospital blood borne pathogens programs. *Infect control Hosp Epidemiol*; 22:73-82.
20. Diaz-Martinez LA and Cadena-AFanador LP. (2003): Risk of hepatitis B infection in Peruvian medical students following occupational expo-

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- sure to blood and body fluids. *Rev Gastroenteral Peru* 23,107-110.
21. Berguer R and Lettler PJ. (2005): Strategies for preventing sharps injuries in the operating room. *Surg clin North Am*; 85:1299-1305.
22. Brasel KJ, Mol C, kolker A, and Weigelt JA. (2007): Needlesticks and surgical residents : who is most at risk? *J surg Educ*; 64:395-398.
23. Berguer R. and Heller PJ. (2004): Preventing sharps injures in the operating room. *J AM Coll Sug* 199;3:462-67.
24. Lamontagne F, Abiteboul D, and Lolom I. (2007): Role of safety engineered devices in preventing needle stick injuries in 32 French Hospitals. *Infect control Hosp Epidemiol* 28;18-23.