

## ORIGINAL ARTICLE

## HEPATITIS–B VACCINATION STATUS AND KNOWLEDGE, ATTITUDE AND PRACTICE OF HIGH RISK HEALTH CARE WORKER BODY SUBSTANCE ISOLATION

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**Background:** HBV infection is occupational risk for health care worker (HCW). They play an important role in dissemination of hepatitis B in society. This study aimed to assess Hepatitis B vaccination status of high transmitter risk group and their knowledge attitude and practice regarding Body substance Isolation. **Method:** This questioner based cross sectional study was conducted in January 2013 to March 2014. 400 HCW comprising of 55% male and 45% female belonging to four groups 100 each doctor, nurse, Operation Theatre and clinical laboratory technician working at different tertiary hospitals in Karachi-Pakistan were included in the study. **Results:** 28% doctors, 20% nurses, 64% operation theatre and 68%lab-technician were fully immunized. Among rest 31% were unaware of vaccine, 45% did not consider themselves among high risk group, 15% expected management to get them vaccinated, 9% found it expensive. Biosafety practices were correctly performed by 42%. 29% performed injection safe practice, 10% aseptic rules and 19% properly sterilized equipment. Blood spill was immediately cleaned by 80% among them 48% applied disinfectant, 40% cleaned it water and detergent, 12% cleaned and disinfected. Blood samples disposal was 52% in any available container, 17% in dustbin and 30% in biohazard bags. In case of accidental needle stick exposure 62 encouraged bleeding, 19% applied alcohol, 11% washed with water, 8% waited for medical help. Regarding discarding used syringe 42% used engineered device, 44% common container, 10% bent needles and 4% one handed scoop technique. Warning symbols were identified by 32% amongst them 30% identified biohazard, 8% harmful, 12% inflammable and 50% danger signs. **Conclusion:** To prevent HCW from Hepatitis their complete immunization should be mandatory and rigid BSI protocol monitored daily.

**Keywords:** Antibody titer, blood borne diseases, HBcAb, HBsAg, HBIG, health hazard, Immunization, needle stick injury, occupational risk, recombivax, tertiary hospital, twinrix

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### INTRODUCTION

In the world approximately one third of global population is reported to be infected with Hepatitis B virus (HBV) among them 350 million have chronic infection and 500,000 patient die each year from cirrhosis and carcinoma of liver. The carrier rate is 3–4% for HBV infection with an estimated 4.5 million carriers. Pakistan is in the intermediate HBV prevalence area.<sup>1</sup>

Hepatitis B virus (HBV) is double stranded DNA enveloped virus measuring 42–47 nm in diameter, with an icosahedral nucleocapsid.<sup>2</sup> It is primarily a hepatotropic virus that replicates only in hepatocytes. Although it is detected in bile duct epithelial cells, peripheral blood mononuclear cells and cells in the pancreas and kidneys but the evidence for viral replication in these cells is controversial.<sup>3</sup> It is highly contagious, transmits through per-cutaneous and per-mucosal exposure by infected blood and other body fluids, mother-to-infant, unsafe injection practices, blood products, blood transfusions and sexual contact. In blood and wound aspirates virus concentration is highest, semen and vaginal fluid has

moderate concentration and the lowest concentration present in saliva.<sup>4</sup>

It is globally documented as significant hazard for workers of tertiary health care hospitals. Risk factor is directly related with the extend of contact with contaminated body fluids, blood, its products and hepatitis B e-antigen (HBeAg) status of source.<sup>5</sup> According to Exposure-Prone Procedure (EPP) high transmitter risk group surgeon, nurses phlebotomist, intensive care unit and emergency department staff, while rest of staff are classified as Low Transmitter Risk group.<sup>6</sup>

Health Care Worker (HCW) can play an important role in reducing the incidence of HBV infection in community. To achieve the aim they should acquire knowledge about Body substance isolation rule (BSI), Standard operating procedure and they need to religiously follow them as per guide lines of World health organization beside They should maintain their immunity level  $\geq 10$  mIU/mL. Hospital management should provide them facilities for their complete immunization.<sup>7,8</sup> In year 1982, 10,000 cases of hepatitis B was reported among HCW. Programme for

immunization of HCW with pre exposure vaccine was initiated.<sup>10</sup> Training and knowledge regarding spread, precaution and prevention of HBV was imparted to them. As result in year 2004, 304 cases of HBV among HCW were recorded.<sup>9</sup>

Occupational Safety and Health Administration (OSHA) recommends pre-exposure and post-exposure antibody testing.<sup>10</sup> It is reported in year 2002–2003, A primary series of 3-doses of HBV vaccine was administered if anti-HBV  $\geq 10$  mIU/mL titer was not reached individual was classified as non-responder. They were then immunized with an additional dose finally a 3-dose revaccination series using standard or high dosage vaccine given to non-responders of fourth dose.<sup>11,12</sup> It was concluded that individual in whom protective levels of anti-HBs 1–2 months after revaccination was not reached they had either genetic factor that caused non responsiveness or they had HBV infection.<sup>13</sup> Advisory Committee for Immunization Practice (ACIP) suggests no further vaccination schedule for them.<sup>14</sup> Currently available vaccines for hepatitis B are recombinax, twinrix and Hepatitis B immune globulin (HBIG). Recombinax containing HBsAg provides active immunity highly recommended for HCWs, patients receiving multiple transfusion or dialysis, patients with frequently sexually transmitted disease and abuser of illicit intravenous drugs. At present booster dose after the initial 3-dose regimen booster dose is usually considered for high risk HCW. Twinrix provides protection against Hepatitis A and B. It has HBsAg and in-activated HAV. Hepatitis B immune globulin (HBIG) is given as immediate passive protection to HCW after an accidental needle stick injury with infected blood.

Tertiary health care hospital may serve as the reservoir and source of spread of hepatitis B virus, HCW needs to follow Body Substance isolation (BSI) rules and adherence to safe practice design may greatly aid in reducing dissemination of HBV and other blood borne infection in society.

Aim of this study was to identify Hepatitis B vaccination status of high risk health care workers that includes doctors, nurses, surgical and laboratory technician. Besides knowledge attitude and practice of HCW regarding Universal Precaution (UP), Body Fluid Isolation (BSI) and Safe Injection Practice of HCW working at different tertiary hospitals in Karachi-Pakistan was assessed.

## MATERIAL AND METHODS

This Cross sectional and descriptive study was conducted from January 2013 to March 2014. A questionnaire was designed to assess the knowledge regarding risk factor, spread, prevention and immunization status of hepatitis B virus (HBV).

Target population consist of 55% male and 45% female high risk transmitter Health care worker that included 100 doctors, 100 nurses, 100 surgical technicians and 100 clinical laboratory technician working at different hospitals in Karachi-Pakistan.

## RESULTS

A total of 400 high risk transmitter group of health care workers, 100 each doctors, nurses, operation theatre technician and laboratory technicians working in tertiary hospitals In Karachi comprising 55% male and 45% female were included in the study. Regarding immunization status 45% of study population was completely immunized, 10% had incomplete vaccination and 45% were unimmunized. Among doctors 28% were completely immunized, 24% incomplete and 48% were not immunized; similarly the results about other health care groups are shown in table 1. Four different reasons quoted by the study participants for none are shown in table-2. Health care worker attitude about biosafety rule is shown in table-3. BSI was followed by 42%, aseptic rules by 10%, Safe injection practice by 29% and proper sterilization of equipment by 19%. 80 % did not immediately clean the biohazard spills, 20% did not take any action and waited for reported supervisor to arrive. 48% used disinfectant to clean the area. 40% cleaned it with water and detergent and 12% disinfected the area after cleaning. 52% discarded blood sample in any available container, 17% in common dustbin, 30% in biohazard container and 1% in any other. Used syringes were discarded by 42% in engineered devices, 44% disposed them off with needle bore in a common container, 10% bended needle with hands, 4% uses one handed scoop technique to close the syringe needle before discarding. After accidental exposure 62% encouraged bleeding under the running water, 19% used alcohol directly, 11% wash with water without encourage bleeding or pressing injured area and 8% waited for medical help. 32% identified warning symbols. Table-4 shows the warning signs identified by the study participants.

**Table-1: Vaccination status of high risk health care worker**

Vaccination status	Complete vaccinated	Incomplete Vaccinated	Un immunized
Doctor	28%	24%	48%
Nurses	20%	8%	72%
Surgical technician	64%	4%	32%
Laboratory Technician	68%	10%	28%
Total 400	45%	10%	45%

**Table-2: Reasons for non-immunization among health care workers**

Reasons	Number of participants
Unaware of being at high risk	45%
Did not know about vaccine	31%
High cost of Vaccine	9%
Employer did not provide facility	15%

**Table -3: Knowledge and attitude regarding body fluid isolation**

<b>Biosafety Rules followed</b>	BSI 42%	Safe Injection Practice 29%	Aseptic Rules 10%	Proper Sterilization of Equipment 19%
<b>Cleaning Of Spills</b>	Immediately 80%	Not concern 20%		
<b>Cleaning agents for blood spills</b>	Used disinfectant 48%	Water and detergent 40%	Water, detergent and disinfectant 12%	
<b>Disposal of blood sample</b>	<b>Dust bin for any specimen 52%</b>	<b>Common container 17%</b>	<b>Biohazard container 30%</b>	<b>Any other 1%</b>
<b>Discarding Used syringe</b>	Engineered device 42%	Syringe with needle bore in common container 44%	Bending needle with hands 10%	One handed scoop technique 4%
<b>Accidental Exposure</b>	Encouraged bleeding under running water 62%	Just washed with water 11%	70% alcohol directly 19%	Wait for medical help 8%

**Table-4: Identification of warning signs and labels on bio disposal bags**

Identification of warning symbols	Identified 32%	Not Identified 8%		
Symbols identified	Biohazard 30%	Harmful 8%	Inflammable 12%	Danger 50%

## DISCUSSION

Healthcare workers in tertiary hospital are at the risk of exposure and possible transmission of vaccine preventable disease hepatitis B. Since majority of them are in constant touch with patient or infective material from patient. Most of the HCW are reported to die due to chronic consequences of the HBV infection.<sup>15</sup> Maintenance of immunity is an essential part of prevention and infection control programme for HCW. It safeguards the health workers and protects dissemination of disease to patient through infected HCW. But most of the tertiary hospitals in Karachi- Pakistan fails to provide enough resource, training and awareness to their high risk health care worker that includes doctors , nurses, operation theatre technicians and clinical laboratory technicians regarding Universal Precaution (UP), Body Fluid Isolation (BSI) and Safe Injection Practice.<sup>16</sup> They remain at the risk of acquiring HBV from occupational exposure that depends on frequency of Per Cutaneous Exposure (PCE) and Muco Cutaneous Exposure (MCE) to infected blood, wound secretions, semen, vaginal fluid and saliva

particularly containing HBsAg.<sup>17</sup> Complete course of vaccination for Hepatitis B virus should be made mandatory for high risk health care personnel. Evaluation of post vaccination antibody response against Hepatitis B surface antigen (anti-HBs) is significant. Presences of hepatitis B core antigen (anti-HBc) in serum of vaccinated individual indicate asymptomatic infection.<sup>13,18</sup> In our study 14% of HCWs had determine their post vaccination antibody titer for anti-HBs and anti-HBc. Gradually in 12 years after post- vaccination detectable antibodies may decline in 60% or less immunized individual. But acquired immunity continues to resist against clinical disease or detectable viremia.<sup>19,20</sup>

According to our study 45% of the HCW were completely immunized, 10% had incomplete immunization .The reasons for remaining un immunized among participants of our study was that 31% did not know about vaccines. It is reported that most of the doctors, 37% nurses and 33% paramedics and 45% participant of our study were un aware of the fact that they belong to high risk group.<sup>21,22</sup> 9% found vaccine too expensive and 15% expected free vaccination facility from hospital management as provided in one of the private hospital in Karachi having 86% completely immunized HCW's.<sup>23</sup> Studies conducted at Lahore and Athens reports 49 and 57% immunized HCW.<sup>22,24,25</sup> In two different studies immunization rate of doctors was found to be 72% and 40% in Lahore , our results showed that 28% doctors were completely immunized and 24% partially immunized.<sup>25</sup> Present study shows 20% nurses and 64% operation theatre technicians and 68% Lab Technicians to be completely immunized. On the contrary in private teaching hospital immunization rate of nurses was higher than the paramedics.<sup>21</sup> In Nigeria 40% doctors, 40% nurses, 70% medical record personnel and 76% for engineering staff were immunized completely.<sup>26</sup> According to our study 72% nurses were un immunized though their exposure rate to infected patient and contaminated material is highest. It is reported that nursing students though aware of efficacy of Hepatitis B vaccine, but preferred to remain un-immunized due to fear of pain from repeated injections, time and money spent on purchase of vaccine.<sup>21,25,27</sup>

Tertiary health care hospital serves as the reservoir and source of spread of hepatitis B virus. HCW needs to follow BSI rules and adhere to safe practice design to prevent dissemination of HBV and other blood borne infection in society. It is a matter of concern to observe that 75% of the HCWs did not follow safe injection practices, 68% were un aware of body substance isolation procedures, 90% did not follow proper aseptic technique and 81% of the OT

technicians applied improper sterilization techniques. Large numbers of HCW were unaware of protective measures to be taken while dealing with infected patients. Most significant mode of transmission of HBV and other blood borne disease is needle stick injury. It poses greater risk than splashes from hollow-bore needles. The best first aid for accidental exposure to blood through needle stick, mucous membrane or non- intact skin is to immediately encourage bleeding and flush the area with water for at least 15 minutes. Beside incident must be instantly reported to a supervisor and a confidential medical examination immediately done. 62% HCW practiced proper first aid techniques, 8% waited for medical help without taking any precaution after needle stick. In tertiary care hospital every health care worker has knowledge about prevention against exposure of needles during phlebotomy because it is injurious to health care workers to expose them accidentally with hepatitis-B patient. To protect health care workers from exposure to blood borne pathogen some regulations are monitored and enforced by Occupational Safety Health Association (OSHA) that recommends the engineering controls (sharp containers) to dispose used syringes. 42% participants use these rules. 44% disposed syringe with needle bore in a common container which is highly injurious to other HCW working in the vicinity patients and their attendants, 10% bent needles with hands, a procedure very injurious and dangerous for themselves and 4% applied one handed scoop technique to close the syringe needle before discarding them. Infectious blood, body substances spills is the cause of spread of hepatitis-B to health care workers on their working bench or area. Immediate action is needed to be taken to clean and disinfect the area according to BSI rules. But 80% HCW did not show any concern about it. 48% of them use only disinfectant to clean the area. 40% cleaned the area with water and detergent and 12% of them disinfected the area after cleaning. It is recommended that blood and body fluid processing area should routinely be cleaned with 1:100 dilution of sodium hypochlorite (household bleach) and in case of spill 1:10 % dilution prepared weekly.

Biologic waste specimens, materials with which the specimens come in contact, supplies contaminated with blood and body fluids, alcohol pads, gauze, bandages, disposable tourniquets, gloves, masks, gowns, plastic tubes and pipettes needs to be discard in appropriately labelled biohazard container/bags with biohazard symbol printed with colored coating of red or yellow . Every HCW in tertiary hospital should have appropriate knowledge regarding biological waste disposal container. Ironically 272 out 400 of our well

qualified, high risk participants could not comprehend the symbols for biohazard, inflammable, harmful and danger printed on our questioner. It was shocking to observe that 64 HCW identified symbol of danger and 12 inflammable as both these sign are displayed at petrol pump/gas stations and various other places. Eleven participants recognized symbol for harmful and 38 HCW correctly identified symbol of biohazard. Though it is imperative that every person working in the tertiary hospital should know these symbols.

## CONCLUSION

There is a low trend of vaccination against Hepatitis B in our HCWs. The KAP of our HCWs is not up to mark. To control the spread of hepatitis B doctors, nurses, phlebotomist, lab personal and operation theatre technician should be immunized prior to joining; periodically their antibody titer should be checked. Work orientation protocol of HCW should include talk about the role of hospitals, labs and clinic in spread and prevention of blood borne and other infectious disease. Hospital management should provide proper equipment/ materials so HCW is able act efficiently according to protocols designed by OSHA, EPP. Management should develop a rigid protocol regarding BSI and vigilantly observe and monitor it on daily basis.

**Conflict of Interest:** Authors declare no conflict of interest.

**Foot Note:** Part of this research work has been presented in 5<sup>th</sup> intercollegiate student Research day 2014 Office of Research innovation and commercialization (ORIC) Department of Research, Dow University of Health sciences Karachi-Pakistan.

## AUTHOR'S CONTRIBUTION

MQ, MJ: Designed research study, collected data and did data analysis, NHA: Supervised their work and wrote manuscript

## REFERENCES

1. Guidelines for protecting the safety and health of healthcare workers. Joint advisory notice. Department of Labor, Department of Health and Human Services Protection Against Occupational Exposure to hepatitis B virus (HBV) and human immunodeficiency virus (HIV). October 19, 1997.
2. Kann M. Structural and molecular virology. In: Hepatitis B Virus Guide. Lai CL, Locarnini S, editors. London: International Medical Press, 2002. p. 9–22.
3. Seeger C, Mason WS. Hepatitis B virus biology. *Microbiol Mol Biol Rev* 2000;64(1):51–68.
4. World Health Organization. Introduction of hepatitis B vaccine into childhood immunization services. World Health Organization (Ed) Geneva: No. Who/V&B/01.31, 2001. p.48.
5. Werner BG, Grady GF. Accidental hepatitis-B-surface-antigen-positive inoculations. Use of e antigen to estimate infectivity. *Ann Intern Med* 1982;97(3):367–9.

6. CDC - NIOSH Publications and Products - Preventing Needlestick Injuries in Health Care Settings (2000-108) [Internet]. [cited 2014 Jan 6]. Available from: <http://www.cdc.gov/niosh/docs/2000-108/>
7. Vaccinia (smallpox) vaccine. Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Recomm Rep* 1991; 40(RR-14):1-10.
8. Draft guidelines for infection control in health care personnel, 1997—CDC. *Notice*. 1997;62(173):47276-327.
9. Osterholm MT, Garayale SM. Clinical viral hepatitis B among Minnesota hospital personnel: results of a ten-year statewide survey. *JAMA* 1985;254(22):3207-12.
10. Agerton TB, Mahoney, SJ, Polish UB, Shapiro CN. Impact of the Bloodborne Pathogens Standard on vaccination of healthcare workers with hepatitis B vaccine. *Infect Control Hosp Epidemiol* 1995;16(5):287-91.
11. Simard EP, Miller JT, George PA, Wasley A, Alter MJ, Bell BP, *et al.* Hepatitis B vaccination coverage levels among healthcare workers in the United States, 2002-2003. *Infect Control Hosp Epidemiol* 2007;28(7):783-90.
12. Weissman JY, Tsuchiyose MM, Tong MJ, Co R, Chin K, Ettenger RB. Lack of response to recombinant hepatitis B vaccine in non-responders to the plasma vaccine. *JAMA* 1988;260(12):1734-8.
13. Alper CA, Kruskall MS, Marcus-Bagley D, Craven DE, Katz AJ, Brink SJ, *et al.* Genetic prediction of non-response to hepatitis B vaccine. *N Engl J Med* 1989;321(11):708-12.
14. Mast EE, Weinbaum CM, Fiore AE, Alter MJ, Bell BP, Finelli L, *et al.* A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: immunization of adults. *MMWR Recomm Rep* 2006;55(RR-16):1-33.
15. Thomas DL, Factor SH, Gabon D, Washington AS, Taylor E Jr, Quinn TC. Viral hepatitis in health care personnel at the Johns Hopkins Hospital. The seroprevalence of and risk factors for hepatitis B virus and hepatitis C virus infection. *Arch Intern Med* 1993;153(14):1705-12.
16. Gunson RN, Shoural D, Roqqendoff M, Zaaijer H, Nicholas H, Holzmann H, *et al.* Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in Health Care Workers (HCWs): guidelines for prevention for transmission of HBV and HCV from HCW to patients. *J Clin Virol* 2003;27(3):213-30.
17. Hadler SC, Doto IL, Maynard JE, Smith J, Clark B, Mosley J, *et al.* Occupational risk of hepatitis B infection in hospital workers. *Infect Control* 1985;6(1):24-31.
18. Centers for Disease Control (CDC). Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to health care and public safety workers. *MMWR Morb Mortal Wkly Rep* 1989;38(suppl 6):1-37.
19. Stevens CE, Toy PT, Taylor PE, Lee T, Yip H-Y. Prospects for control of hepatitis B virus infection: implications of childhood vaccination and long-term protection. *Pediatrics* 1992;90(1 Pt 2):170-3.
20. Hadler SC, Margolis HS. Hepatitis B immunization: vaccine types, efficacy, and indications for immunization. *Curr Clin Top Infect Dis* 1992;12:282-308.
21. Nasir K, Khan KA, Kadri WM, Salim S, Tufail K, Sheikh HZ, *et al.* Hepatitis B vaccination among health care workers and students of a medical college. *J Pak Med Assoc* 2000;50(7):239-43.
22. Rachiotis G, Goritsas C, Alikakou V, Ferti A, Roumeliotou A. Vaccination against Hepatitis B virus in workers of a general hospital in Athens. *Med Lav* 2005;(1):80-6.
23. Llewellyn LJ, Harvey I. Hepatitis B vaccination: how many doctors are fully covered? *J Public Health Med* 1994;16(3):352-6.
24. Ali NS, Jamal K, Qureshi R. Hepatitis B Vaccination Status and Identification of Risk Factors for Hepatitis B in health care workers. *J Coll Physicians Surg Pak* 2005;15(5):257-60.
25. Younis BB, Khan GM, Akhter P, Chaudary MA. Vaccination against hepatitis B Among doctors at teaching hospital in Lahore. *Pak J Med Sci* 2001;17:229-32.
26. Fatusi AO, Fatusi OA, Esimai AO, Onayade AA, Ojo OS. Acceptance of hepatitis B vaccine by workers in a Nigerian teaching hospital. *East Afr Med J* 2000;77(11):608-12.
27. Lin WC, Ball C. Factors affecting the decision of nursing students in Taiwan to be vaccinated against hepatitis B infection *J Adv Nurs* 1997;25(4):709-18.

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