Comparison of Awareness of Post-exposure Prophylaxis Protocol Following Needle Stick Injuries Against HBV, HCV and HIV among Different Groups of Health Care Workers: A Multicenter Experience

Fatima Kaleem*, Hassan Saleem**, Muhammad Usman Shah***, Usman Ali****, Irum Aftab*, Umme Farwa*, Tariq Butt*****

*Foundation University Medical College. Islamabad
**Quaid-i-Azam International Hospital, Islamabad
***Leicester Royal Infirmary Leicester Royal Infirmary, England
****Fauji Foundation Hospital, Rawalpindi
*****Islamic International Medical college, Rawalpindi

Abstract

Background
Needle stick injuries can infect healthy individuals with hepatitis B, hepatitis C and Acquired immunodeficiency syndrome. Despite this, the health care professionals know a little about the vaccination schedule, post exposure prophylaxis protocol and how to deal if a needle stick injury occurs.

Objectives
To find the incidence of needle stick injuries, awareness about post exposure prophylaxis of hepatitis B virus, hepatitis C virus, human immunodeficiency virus and vaccination trend of hepatitis B virus in various groups of health care workers.

Materials and Methods
A descriptive, cross-sectional study was carried out via convenient sampling from Jan 2016-Jan 2017, in the Foundation University Medical College, Islamabad, Military and Combined Military Hospitals, Rawalpindi, PAEC General Hospital Islamabad and Quaid-e-Azam International Hospital Islamabad. The data was collected, analyzed and interpreted in terms of frequency and percentages.

Results
A total of six hundred and thirty-nine individuals participated in the study. Four hundred and fifty-four (71%) were vaccinated against Hepatitis B virus infection. Only two hundred and ninety-four (46%) knew of post exposure prophylaxis against hepatitis B virus and hepatitis C virus needle stick injuries. Only fifty-nine (9.2%) were aware of post exposure prophylaxis that against HIV needle stick injuries.

Conclusion
There is a general lack of reporting of needle stick injury among healthcare workers due to lack of knowledge of presence of responsible authorities. Awareness of post exposure prophylaxis is also not sufficient especially against HIV.

Acknowledgments
The authors thank all the participants included in the study for their valuable time.

Corresponding Author: Fatima Kaleem, Associate Professor of Pathology, Foundation University Medical College. Islamabad.
Email: fatima_kaleem@hotmail.com

Background
Needle stick injuries (NSIs) are injuries that occur as a result of trauma caused by syringe needles, sutures and other sharp surgical and medical instruments available in hospitals. Each year almost 400,000 cases occur in the United Kingdom alone.[1] This number is expected to be several times higher in our country because of casual attitude of health care providers, lack of reporting infrastructure and lack of accountability. In a study from Karachi 85% of the health care workers (HCWs) had a history of needle stick injury.[2] The risk factors for needle stick injuries include, non-use of safety containers for sharp disposal, less working experience, under staffing and high emotional exhaustion.[3] The significance lies in the transmission of major diseases including hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). For HBV, such transmission rates may be variable ranging from 1-6% in HBeAg negative to 22-40% in HBeAg positive patients.[4] Other studies showed a rate of 76.2% among nurses[5] and 74% in health care workers (HCWs).[6] Hospital waste collectors possibly suffering from such NSIs had a high prevalence rate of 23% for HBV.[7] The risk of transmission for HCV and HIV is lower but still substantial with 3-10% and 0.2-0.5% respectively.[8] Health care workers were also found to have a greater incidence of HCV than the general population.[9,10] Pakistan is among the

countries in the world with high prevalence of hepatitis C (above 6%) and hepatitis B (around 4%) in general population.[11,12] This adds more to the risk of transmission of these infections via needle stick injuries(NSI) as healthcare personnel may be pricked more than once, adding to an increased risk.

Transmission of such infections may be affected by several factors. In general, deep injuries, punctures with visible blood on the device, especially those previously installed in veins and arteries, and higher virus titers in the transmitting patients were thought to high risk cases.[13] For HBV, other risk factors include HBeAg positivity, higher HBV DNA content in blood, and no previous immunization.[14] The degree of immunization was indirectly related to the rate of transmission with no such cases in centers were a majority of the HCWs were immunized[15] HIV transmission was directly related to the stage and severity of the disease in the transmitting individuals[16] and to the higher level of HIV titers in the transmitting blood.[17]

To limit such spread, post exposure prophylaxis (PEP) may be employed. It refers to the measures taken after possible incidents that result in seroconversion and even acquisition of active disease by the affected individuals. Such measures include immunization and immunoglobulin and anti-retroviral administration against HBV and anti-retroviral therapy against HIV.[18,19] The effectiveness is well reported in medical literature.

Keeping in view the high prevalence of HBV and HCV and the increasing incidence of HIV in Pakistan and the preventable nature of NSI acquired infections, awareness of PEP among our HCWs is more important than ever. We have limited data from our region on possible high-risk groups with limited awareness on the above matter. This study would highlight such groups in order to tackle them more effectively.

Materials and Methods

A descriptive, cross-sectional study was carried out from Jan 2016-Jan 2017, in the Foundation University Medical College, Islamabad, some units of Military and Combined Military Hospitals, Rawalpindi, PAEC General Hospital Islamabad and Quaid-e-Azam International Hospital Islamabad after taking proper ethical approval from ethical review committees of respective institutes. All health care workers including house officers, specialist trainees, consultants, nursing staff of Hospitals and final year medical students of Foundation University Medical College, Army Medical College, Rawalpindi, were included in the study. The departments included in the study were surgery, medicine and obstetrics/ gynecology. Non-medical staff (waste disposers) and junior medical students were excluded. Convenience sampling was adopted. All participants were interviewed separately and the data recorded on data forms. They were asked about their vaccination status (vaccination administered or not, antiHBs Ag levels) and the application of all three doses of HBV vaccine along with the possible steps that they would take in case of spill of infectious blood on their skin. For the former, only those that received all three doses were considered to be vaccinated while for the latter, a correct response was considered if it included washing with soap or alcohol based hand scrub along with reporting to senior staff. A past history of NSI was inquired about and whether it had been reported to infection control or occupational health committee of the respective institute. A correct protocol for NSI was considered if it included allowing flow of blood from the affected site with subsequent washing with soap or alcohol hand scrub and reporting of the accident to the authorized staff. Post exposure prophylaxis against HCV was considered correct if it included correct management of the NSI and follow up follow-up after 3 and 6 months with liver function tests (LFTs) and PCR for HCV RNA. For HBV, in addition to the above mentioned protocol for HCV, a correct response was considered if it included hepatitis B vaccination and HBIG administration with follow-up after 3 and 6 months with liver function tests (LFTs) and PCR for HBV DNA while that for HIV included the above plus use of anti-retro viral agents at the first instance within 24 hours and extending up to 4 weeks. The data was collected, analyzed and interpreted in terms of frequency and percentages. After recording of individual responses from all participants, all the participants of the study were guided about the internationally accepted post exposure protocols of post exposure prophylaxis against HBV, HCV and HIV.

Results

A total of six hundred and thirty-nine individuals participated in the study comprising three hundred and twenty males and three hundred and nineteen were females (aged between 20-44 years). Of these two hundred and forty-five (38%) were medical students, one hundred and twenty-one (19%) nurses, one hundred and thirty-two (21%) house officers, ninety-eight (15%) medical officers and postgraduate trainees (MO/PG) and forty-three (7%) consultants. Four hundred and fifty-four (71%) were vaccinated against HBV of which one hundred and eighty-six (41%) were students, thirty-nine (8.5%) were nurses, one hundred and four (23%) were house officers, eighty-four (18.5%) were medical officers and postgraduate trainees and forty-one (9.0%) consultants. The frequency of vaccination among students was 76% while 32% among nurses, 79% among house officers, 86% among medical officers and postgraduate trainees and 95% among consultants. One hundred and ninety-six admitted (31%) to ever receiving a needle stick injury in the past. Figure1 shows incidence of NSI in among different groups.

Only thirty-two (16%) of those that received a NSI ever reported it to the infection control/ occupational health center, rest stating that they were unaware of the existence of any such centers. While four hundred and two (63%) knew how to deal with infectious blood spill on skin, only two hundred and ninety-four (46%) knew of PEP against HBV and HCV NSI. Figure2 shows incidence of awareness of PEP against HBV and HCV in various groups.

Fifty-nine (9%) were aware of PEP against HIV NSI. Figure 3 shows incidence of awareness about PEP against HIV in various groups.

Discussion

Our study showed that 196 (30.6%) participants had a previous history of NSI of which bulk was attributed to the nursing staff (87 cases, 44.4%) followed by house officers and Post graduate trainees/ medical officers. Medical students and consultants had the least number of NSIs. These results were similar to those reported by Butsashvili (45%)[20] and Naderi (74%)[21] and is almost double to that determined by Bodkin (16.4%)[22] and Baldo (24% NSI) in 5 years.[23] Bodkin *et. al.*, also stated that the incidence of such events was greater in doctors (33.5%) than in nurses (15.6%). However, the situation in our country is different with the nursing staff being at a much higher risk (71.9%). Other studies however revealed that nurses are more prone to such accidents with Black *et al* [24] reporting 64.4% NSIs being attributed to them followed by Butsashvili (34%)[20] and Ayranci *et al* (76.2%).[5]

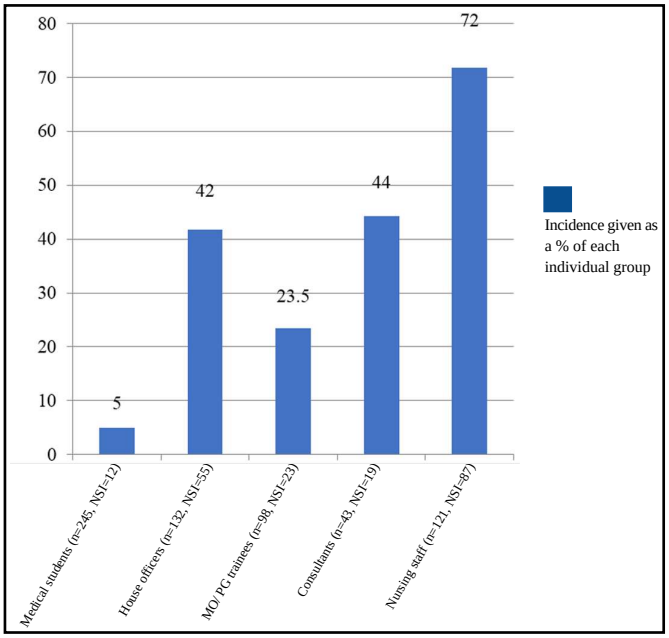

Fig 1. Incidence of positive history of NSI among different groups

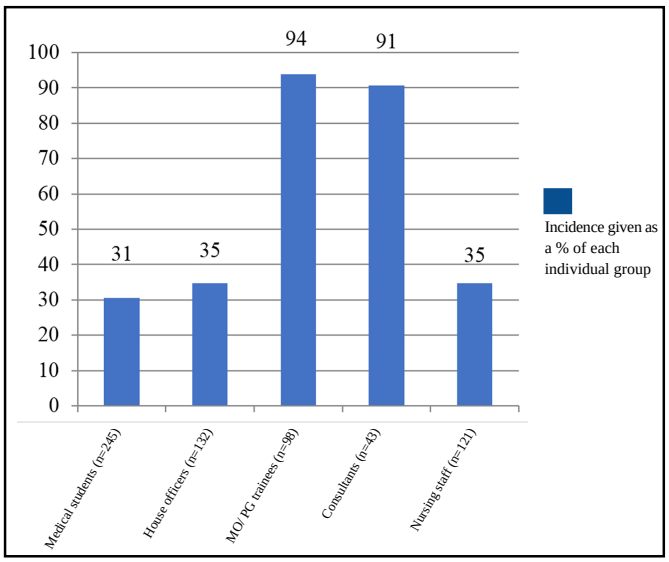

Fig 2. Incidence of awareness of PEP against HBV and HCV NSI among different groups

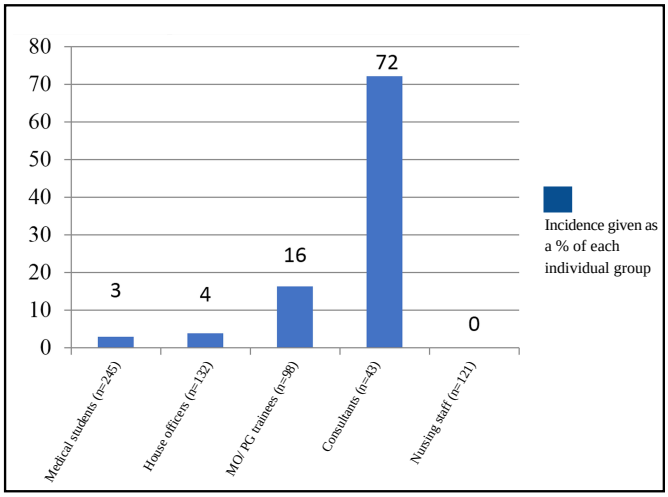

Fig 3. Awareness of PEP against HIV NSI among different groups

Our study also revealed a low incidence (16.3%) of reporting of NSIs to responsible higher authorities or infection control committees the reason being no prior knowledge of existence of such committees. This is comparable to another study which showed a reporting incidence of 9% among doctors and 46% among midwives.[25] Although, they attributed it to either lack of time to report or lack of knowledge of PEP measures. This is substantially lower than that determined by Ayranci *et al* showing a reporting rate of almost 31%.[5] A lower reporting rate in consultants can also be attributed to the "know it all attitude" of senior professionals and in junior doctors and nursing staff because of lack of knowledge of existence of such infection control committees. Although all the institutes included in this study have their infection control committees but most of the working staff and students appear to be unaware of their existence.

Although 71% of the participants in our study were vaccinated against HBV, only 32.3% of nurses were actually vaccinated as compared to doctors and medical students where the incidence was greater than 75%. These values are lower than those calculated by Meyer *et al*. (82%).[14]

In a study by Ayranci *et al*[5] a much greater coverage (67.6%) of HBV vaccination among nurses. Unlike a study by Odusanya where only 2.6% of medical students were properly vaccinated, the incidence in our region was satisfactory.

The awareness of PEP against HIV was poor with only 59 (9.2%) knowing how to adequately deal with the situation. Of these, consultants were most aware (72.1%, Figure 3). Awareness was significantly lacking among other groups. This is much lower than that calculated for India (38.2%) despite being a neighboring country.[26]

More residents in Nigeria (41%)[27] and Malaysia (50%)[14] were aware about the necessary measure in such cases than those in Pakistan (16.3%).

The incidence of awareness of PEP against HBV and HCV was similar being 46% for both. Overall, PGs/MOs were most aware followed by consultants while nursing staff, medical students and house officers were the least.

Conclusion

There is a general lack of reporting of NSI among healthcare workers due to lack of knowledge of presence of responsible authorities. Awareness of PEP is also not sufficient especially against HIV among those groups directly involved with patients and their care, namely, nursing staff and house officers. Ironically, these are the ones suffering the most from NSIs. This is in the back drop of a more aware group of consultants thus showing a lack of transmission of such knowledge. This bridge needs to be gapped to improve the current situation. Seminars, posters and lectures may be arranged for junior doctors and nurses by qualified personnel in order to increase this awareness.

Conflict of Interest

None

Limitations of Study

Junior medical students and non medical staff (waste disposers, Janitors etc) who are also exposed to NSIs were not included in the study. Further studies need to be done on those groups as well.

References

1. Needle-stick Injuries; NHS Employers, 2009.
2. Khurram M, Ijaz K, Bushra HT, Khan NY, Bushra H, Hussain W. Needle-stick injuries: a survey of doctors working at Tertiary Care Hospitals of Rawalpindi. *J Pak Med Assoc* 2011;61(1):63-5.
3. Cho E, Lee H,a Choi M, Park SH, Yoo Y, Aikend LH. Factors associated with needle stick and sharp injuries among hospital nurses: A cross sectional questionnaire survey. *Int J Nurs Stud* 2013; 50(8): 1025–1032. Published online 2012 Jul 31. doi: 10.1016/j.ijnurstu.2012.07.009
4. Sepkowitz KA. Occupationally acquired infections in health care workers. Part II. Ann Intern Med. 1996;125(11):917-28.
5. Ayranci U, Kosgeroglu N. Needlestick and sharps injuries among nurses in the healthcare sector in a city of western Turkey. *J Hosp Infect* 2004;58(3):216-23.
6. Rachiotis G, Papagiannis D, Markas D, Thanasias E, Dounias G, Hadjichristodoulou C. Am Hepatitis B virus infection and waste collection: prevalence, risk factors, and infection pathway. *J Ind Med* 2012;55(7):650-5)
7. Gerberding JL. Management of occupational exposures to blood-borne viruses. *N Engl J Med* 1995;332:444-51.
8. Puro V, De Carli G, Segata A, Piccini G, Argentero PA, Signorini L, Daglio M, Penna C, Marchegiano P, Miniero M, Cinti G, Tavanti L, Maggiore A, Sossai D, Micheloni G; Giuseppe. Update on the subject of epidemiology of blood-transmitted occupational infections. *G Ital Med LavErgon* 2010;32(3):235-9
9. Lanphear BP, Linnemann CC Jr, Cannon CG, DeRonde MM, Pendy L, KerleyLM.Hepatitis C virus infection in healthcare workers: risk of exposure and infection. *Infect Control Hosp Epidemiol* 1994;15(12):745-50.
10. AVERT - Healthcare workers and HIV Prevention – Website
11. Umer M, Iqbal M. Hepatitis C virus prevalence and genotype distribution in Pakistan: Comprehensive review of recent data. *World J Gastroenterol* 2016; 22(4): 1684–1700. Published online 2016 Jan 28. doi: 10.3748/wjg.v22.i4.1684
12. Ali M, Idrees M, Ali L, Hussain A, Rehman I, Saleem S, Afzal S, Butt S. Hepatitis B virus in Pakistan: A systematic review of prevalence, risk factors, awareness status and genotypes. *Virol J* 2011; 8: 102. Published online 2011 Mar 6. doi: 10.1186/1743-422X-8-102.
13. Mahoney FJ, Stewart K, Hu H, Coleman P, Alter MJ. Progress toward the elimination of hepatitis B virus transmission among health care workers in the United States. *Arch Intern Med* 1997;157:2601-5
14. Occupational exposures with risk of transmission of HIV, HBC and HCV in health care workers. Meyer U, Chuard C, Regamey C. *Rev Med Suisse* 2005;1(36):2327-31.
15. HIV post-exposure prophylaxis - guidance from the UK Chief Medical Officers Expert Advisory Group on AIDS, Dept of Health, September 2008.
16. Denise M. Cardo, David H. Culver, Carol A. Ciesielski, Pamela U. Srivastava, Ruthanne Marcus, Dominique Abiteboul, Julia Heptonstall, Giuseppe Ippolito, Florence Lot, Penny S. McKibben, David M. Bell. A Case–Control Study of HIV Seroconversion in Health Care Workers after Percutaneous Exposure. *N Engl J Med* 1997; 337:1485-1490.
17. Meyer U, Chuard C, Regamey C. Occupational exposures with risk of transmission of HIV, HBC and HCV in health care workers. *Rev Med Suisse* 2005;1(36):2327-31.
18. Watanabe T, Tsutsumi SH, Yokomaku Y, Imamura J, Sugiura W, Tanaka Y. Post-exposure Prophylactic Effect of Hepatitis B Virus (HBV) Active Antiretroviral Therapy against HBV Infection. *Antimicrob Agents Chemother* 2015; 59(2): 1292–1298. Published online 2015 Jan 27. Prepublished online 2014 Dec 15. doi: 10.1128/AAC.04459-14
19. Sheth SP, Leuva AC, Mannari JG. Post Exposure Prophylaxis for Occupational Exposures to HIV and Hepatitis B: Our Experience of Thirteen Years at a Rural Based Tertiary Care Teaching Hospital of Western India. *J Clin Diagn Res* 2016; 10(8): OC39–OC44. Published online 2016 Aug 1. doi: 10.7860/JCDR/2016/19876.8387
20. Butsashvili M, Kamkamidze G, Kajaia M, Morse DL, Triner W, Dehovitz J, McNutt LA. Occupational exposure to body fluids among health care workers in Georgia. *Occup Med (Lond)* 2012 Dec;62(8): 620-6.
21. Naderi H, Sheybani F, Bojdi A, Mostafavi I, Khosravi N. Occupational exposure to blood and other body fluids among health care workers at a university hospital in Iran. *Workplace Health Saf* 2012 Oct;60(10):419-22.
22. Bodkin C, Bruce J. Curationis. Health professionals' knowledge of prevention strategies and protocol following percutaneous injury. 2003;26(4):22-8
23. Baldo V, Floreani A, Dal Vecchio L, Cristofoletti M, Carletti M, Majori S, Di Tommaso A, Trivello R. Occupational risk of blood-borne viruses in healthcare workers: a 5-year surveillance program. *Infect Control*

Hosp Epidemiol 2002;23(6):325-7.
24. Black L. Chinks in the armor: Percutaneous injuries from hollow bore safety-engineered sharps devices. *Am J Infect Control* 2012. pii: S0196 6553(12)00889-9.
25. Contamination incidents among doctors and midwives: reasons for non reporting and knowledge of risks. Burke S, Madan I. *Occup Med (Lond)* 1997 Aug;47(6):357-60.
26. Wig N. HIV: Awareness of management of occupational exposure in health care workers. *Indian J Med Sci* 2003; 57:192-8
27. Nwankwo TO, Aniebue UU. Percutaneous injuries and accidental blood exposure in surgical residents: Awareness and use of prophylaxis in relation to HIV. *Niger J Clin Pract* 2011;14:34-7.