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Research Article

Occupational exposure, drug toxicities and adherence to HIV post exposure prophylaxis: a cohort study at the teaching hospital in Erode district, Tamilnadu, India

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ABSTRACT

Background: Human immunodeficiency virus (HIV) infection to healthcare personals follows occupational exposure follows accidental needle stick injuries can be minimized less than <1% with post-exposure prophylaxis with antiretroviral drugs in time. Retrospective review of records of occupational exposure to HIV, analyse post exposure prophylaxis drug side effects and adherence.
Methods: On-going documentation of occupational exposures with known source of infection (HIV reactive) reported at IRT Perundurai Medical College Hospital, Erode district, Tamilnadu, India from January 2008 to March 2016 were reviewed.
Results: A total of 14 cases (4 males and 10 females) occupational exposure to HIV infections were documented. 9 interns, 13 needle stick injuries, 7 needle recapping, 8 mild exposure, 10 washing with water or soap and water, 11 with less than one year of practical experience, 10 completed the follow up were the common subdivisions. ZL for 12 and TLE for 2 were prescribed. Nausea and vomiting were the commonest and bothersome side effect. One intern stopped PEP after 4 days because of extensive nausea, vomiting and fatigue but all others completed PEP.
Conclusions: HCPs need to be given in-service training and mentoring regarding universal work precautions, management of occupational exposure, PEP, adverse events and management, and continued active follow-up to ensure the adherence by mobile and social media. This is very helpful in curtailing the risk of occupational HIV sero-conversion.

Keywords: Human immunodeficiency virus, Health care personnel, Occupational exposure, Post-exposure

INTRODUCTION

NACO (National AIDS Control Organization) guidelines state that HIV epidemic in India is concentrated among High Risk Groups and heterogeneous in its distribution. Overall trends of HIV portray a declining epidemic at national level (23.2 lakhs in 2006 to 21 lakhs in 2011) by the prevention and treatment strategies. The needle stick injuries are common under reported and studied occupational hazards in all healthcare facilities. Nearly 1 million healthcare personals annually experience needle stick injuries worldwide.

Of these, 100 are infected with diseases such as hepatitis B, hepatitis C, and HIV. This is attributed to the screening for HIV, HBV, HCV and practicing universal precautions are not always practically possible in health care settings mainly in emergencies.[1,2] Based on national,

WHO, CDC guidelines we have key definitions with reference to post exposure prophylaxis. Occupational exposure refers to exposure to potential blood-borne infections (HIV, HBV and HCV) that occurs during performance of job duties. Non-occupational exposure refers to exposure to potential blood-borne infections (HIV, HBV, HCV) outside of the work setting.

Post Exposure Prophylaxis (PEP) refers to the comprehensive management given to minimize the risk of infection following potential exposure to blood-borne pathogens (HIV, HBV, and HCV). This includes counselling, risk assessment, relevant laboratory investigations based on informed consent of the source and exposed person, first aid and depending on the risk assessment, the provision of short term (4 weeks) of antiretroviral drugs, with follow up and support. "Health Care Personnel (HCP)" is defined as any persons, paid or unpaid; working in healthcare settings who are potentially exposed to infectious materials (e.g. blood, tissue, and specific body fluids and medical supplies, equipment, or environmental surfaces contaminated with these substances).

HCP include: emergency care providers, laboratory personnel, autopsy personnel, hospital employees, medical and nursing students and health care professionals of all levels. "Exposure" which may place an HCP at risk of blood-borne infection is defined as: a percutaneous injury (e.g. needle-stick or cut with a sharp instrument), contact with the mucous membranes of the eye or mouth, contact with non-intact skin (particularly when the exposed skin is chapped, abraded, or afflicted with dermatitis), or contact with intact skin when the duration of contact is prolonged (e.g. several minutes or more) with blood or other potentially infectious body fluids.[3-5]

Various studies lay emphasis on adherence counselling with psychological support .This is to ensure the more than 95% adherence, which is important in order to maximise the efficacy of the medications in PEP. In adherence counselling following facts such as mild and transient uncomfortable side-effects(nausea, diarrhoea, muscular pain and headache), occur mainly at the beginning of the treatment and compare to PLHV(People Living with HIV) more side effects experienced by the HCPs, can be controlled with the symptomatic measures. The earliest treatment should be within 2 hours, combination treatment yields best prevention, delaying initiation after 72 hours, shortening the duration or decreasing the antiretroviral dose of PEP, individually or in combination, decreased its prophylactic efficacy. We have to start the PEP as per the latest national guidelines within no time for better efficiency.[6-10]

Aims and objectives of the study

- Review of the reported occupational exposure to HIV
- Analyse the post exposure prophylaxis drug side effects and adherence in study group

METHODS

Study design and period

This present work is based on a retrospective review of records of on-going documentation of all occupational exposures with known source of infection (HIV reactive) reported at our institution over a period from January 2008 to March 2016. The study protocol was approved by our institutional ethical committee.

Inclusion criteria

Any HCP in our IRT Perundurai Medical College Hospital having directly/ indirectly exposed to needle stick injuries of a known source (People Living with HIV- PLHIV) comprised the study material. In the institution, we are providing HIV screening and continuum of care through Integrated Counselling and Testing Centre (ICTC). In ICTC all the PLHIV related services are delivered including free ART drugs from by Link ART services. We are maintaining PEP record registry as per the NACO guidelines, which is regularly reviewed by Tamilnadu State AIDS Control Society in the prescribed format.

PEP drugs as per the NACO guidelines available in the ICTC and in Casualty Department for emergency care for accidental exposure. This is to ensure the availability even in the nonOPD hours. Drugs are issued for two days and the person exposed is requested to attend counselling and testing centre in regular hours (8 a.m. to 4 p.m.) We are doing the baseline counselling and testing (for HIV, HCV, anti-HBs, Complete blood count, Liver function test) here and referring to nearby ART centre at Erode District Head Quarters Hospital for reporting , evaluation by the medical officer in charge and getting the complete course of PEP drugs. All the HCP were vaccinated for HBV infection.

We ensured the follow up (enhanced adherence counselling, clinical assessment, testing, side effects, safer sex, and abstinence from blood and organ donation) as per the national protocol. In this process we made sure the prescription of post-exposure prophylaxis followed the consent based on an understanding of the risks and benefits, including discussion of possible side effects and the importance of full adherence to post-exposure prophylaxis. We analysed our register with all the details of HCP reporting for PEP.

The hospital infection control committee with the guidance from administration includes members from various departments like medicine, surgery, OBG, clinical microbiology, nursing staff, pharmacy, waste management/housekeeping services. This committee ensures the infection control and biomedical waste

management as per the NACO guidelines and state pollution control board rules and regulations. The nursing superintendent observed the day to day infection control and hospital waste management implementation.

RESULTS

A total of 14 cases (4 males and 10 females) in our centre were analysed (Table 1). Majority (9/14) of exposed HCP comprised of CRRI (internship doctors), followed by laboratory technicians (3/14) and staff nurse (1/14) nursing student (1/14). Majority of exposed HCPs (10/14) came within 12 hours followed by between 12 to 24 hours (3/14) and one lab technician enrolled for PEP after 48 hours. Needle stick injury was the commonest injury accounting for (13/14) of cases, with majority of them exposed to hollow bore needle (11/14).

Place of occurrences were in patient wards (8/14), ICU blood collections centres (4/14), intensive care units (2/14). In our study, 10/14 injuries happened in the non-outpatient hours, (4/14) in the outpatient hours. All the house surgeons had injuries in the odd hours, lab technicians had in the outpatient hours.

All the HCP were had contact with blood and blood products. Exposure code wise, majority of them had mild exposure 8/14 (superficial wound with a low calibre needle or subcutaneous injections following small-bore needles), followed by moderate 4/14 (cut or needle stick injury penetrating gloves) and severe 2/14 (accident with 18G venflon that has previously been used intravenously) cases.

In present study, accidental needle stick injuries have occurred while handling with (hollow-bore needle 11/14, venflon 2/14, glass 1/12). The following activities associated with needle stick injuries in our records were improper recapping (7/14), manipulating needle while starting intra venous line 4/14, handling/passing device during or after use 2/14, improperly disposed sharps 1/14.

Immediate responses after the needle stick injury was to wash the affected area either with water or soap and water (10/14) followed by application of sprit/ alcohol/ antiseptics (4/14). Zidovudine (AZT)+Lamivudine (3TC), 2-drug regimen (basic PEP regimen) for 12/14 and Tenofovir Disoproxil Fumarate (TDF)+Emtricitabine (FTC)+Efavirenz (EFV), 3-drug regimen for 2/14 were administered in accordance with guidelines, availability of fixed dose combination in ART centre at the time of exposure.

The HCPs who have less than one year practical experiences like internes, nursing students were experienced needle stick injuries (11/14) followed by the staff nurse and lab technicians (3/14) who joined the service in the recent past (less than 10 years). In present study group, all HCP's underwent baseline serological assessment on the day of counselling and all were negative. During the follow up visit regular employees like staff nurse, lab technicians underwent follow up on the 3rd and 6th month. 4 of the internes completed the internship earlier have not reported for 3rd and 6th month of the after the PEP completion, all others (10/14) completed the follow up visits on 3rd and 6th months. All were non-reactive and till date. HIV reactivity after occupational exposure is nil our study population.

Side-effects and adherence to PEP

The following side effects of PEP were documented and managed as per the NACO guidelines. Nausea & vomiting 10/ 14; Fatigue 8/ 14; Headache 8/ 14; Diarrhoea 4/ 14; Pallor 4/14; CNS side effects:- Anxiety, nightmares, psychosis, depression 2/ 14; Rash 2/14; Fever 1/14; numbness or painful feet/legs 1/14. Jaundice or abdominal or flank pain or tingling or blue /black nails were not reported in present study.

Nausea and vomiting experienced by most of them, fatigue was bothersome for all those experienced. One intern stopped the drugs after 4 days because of extensive nausea and vomiting. All others completed the 28 days of PEP, but during the course of the PEP missing of doses, rescheduling the doses were observed.

One intern experienced the erythema multiforme, macules and papules, target (iris like) skin lesions with itching in the upper and lower extremities, few mucosal oral erosions after 3 days of PEP. He was counselled, continued ART with measures to control the cutaneous eruptions. Skin and mucous membrane lesions resolved after the treatment.

One staff nurse on ZL regimen, was suffered from the anxiety, nightmares, psychosis; depression. One lab technician on TLE also was suffered from similar psychiatric complanits. She underwent continuous psychological counselling and treatment from psychiatric department and clinically improved afterwards. Both of them do not have similar aliments in the past.

DISCUSSION

Universal work precautions emphasize the need of treating the entire patient as potentially infectious for blood borne infections like HIV, HBV and HCV. All the health care providers are exposed to the common cold to blood borne infections throughout the career.

Varghese GM et al, in their review article, stated that developing countries had more occupational exposure, due to high incidence of the blood borne infections, and unsafe practices.[11] Pune based study during 2003-5, the incidence of high-risk exposures was 6.8/100 PY (n=339); 49.1% occurred during a procedure or disposing of equipment and 265 (80.0%) received a stat dose of PEP, 48.4% of high-risk cases began an extended PEP regimen, of whom only 49.5% completed it.[12] Rhode

Island Emergency Departments, a retrospective study of emergency department's visits for blood or body fluid exposures, 72.5% sustained a percutaneous injury and only 2.5% were exposed to a known source of HIV.[13]

Jeremy JE Johnston et al, retrospective review of all emergency notes triaged as needle stick injury for from July 2001 to July 2002, observed a deferral and lack of urgency in the assessment and treatment of needle stick injuries.[14]

Table 1: Consolidate features of health care personnel reporting in the study.

Date of Reporting	Age	Sex	Designation	Date of Exposure	Where-place	When-timing	By what-Device	How	Immediate response	Exposure code	Regimen	Side effects	Follow up
7/1/2008	23	F	CRRI	5/1/2008	IP	Non OP	Hollow bore needle	Recapping	Cleaning with water	Mild	ZL	Nausea & vomiting , fatigue, headache	Weeks 2,4,6
8/3/2008	36	F	Lab technician	8/3/2008	Lab	OP	"	"	"	"	"	Nausea & vomiting , fatigue, headache, pallor	Weeks 2,4,6; Months 3 & 6
24/4/2008	23	M	CRRI	22/4/2008	IP	Non OP	"	"	"	"	"	Nausea & vomiting , fatigue, headache	Weeks 2,4,6
5/11/2008	24	M	"	5/11/2008	"	"	"	"	"	"	"	Nausea & vomiting , diarrhoea	"
23/11/2008	23	F	"	23/11/2008	"	"	"	"	"	"	"	Nausea & vomiting , fatigue, headache, pallor	"
4/3/2009	24	F	"	3/3/2009	ICU	"	Venflon	IV line handling	"	Severe	"	Nausea & vomiting, fatigue	Weeks 2,4,6; Months 3 & 6
5/3/2009	23	F	"	3/3/2009	"	"	"	"	"	"	"	Headache, nausea & vomiting	"
24/4/2010	23	F	"	24/4/2010	IP	"	Hollow bore needle	Recapping	"	Mild	"	Nausea & vomiting , fatigue	Stopped the PEP on day 5
2/4/2012	50	F	Lab technician	2/4/2012	"	OP	"	"	"	Moderate	"	Nausea & vomiting , fatigue, pallor	Weeks 2,4,6; Months 3 & 6
25/2/2013	19	F	Nursing Student	25/2/2013	"	"	"	"	Cleaning with antiseptics	"	"	Headache, nausea & vomiting , pallor, diarrhoea	"
5/4/2013	35	F	Staff Nurse	5/4/2013	"	"	"	"	"	"	"	Headache, anxiety, nightmares psychosis, depression	"
23/5/2014	22	M	CRRI	22/5/2014	"	Non OP	"	"	"	Mild	"	Headache, rash, fever, numbness	"
10/6/2014	39	F	Lab technician	10/6/2014	Lab	OP	Glass slide	Cleaning	Cleaning with water	"	TLE	Fatigue, diarrhoea, anxiety, nightmare, psychosis, depression	"
14/3/2015	23	M	CRRI	14/3/2015	IP	Non OP	Hollow bore needle	Recapping	Cleaning with antiseptics	Moderate	"	Rash, diarrhoea	"

Nigerian study on PEP revels that 63% for the exposures due to needle stick injuries; Surgical operations and venopuncture were the common procedures at the time of exposure. Commonest first aid was washing with water and cleaning with spirit. This study highlighted the need of the effective training on UP/PEP, institutional guidelines, mandatory use of protective barriers like foot wears, gloves, masks, goggles and aprons.[15]

Shriyan et al, study on incidence of occupational exposures out of 59 needle stick injuries , 31 were from known source, in that 13 were seropositive (7:HIV, 3 each HCV and HBV). Most of the incidence during needle re-capping, then so far no case of sero conversion following the needle stick injuries.[16] In retrospective analysis by Aggarwal V et al, more than half of the injuries were sustained by HCPs with practical experience of less than 1 year. Percutaneous injury with a hollow bore needle was responsible for 82.5% (n=85) of occupational exposures, while injury with solid bore needles was reported in 15 (14.5%) and with other sharps in 3 (2.8%) cases.15/82 HCP completed the full course of PEP, but complete follow up was very poor, HIV status at 6 month of exposure was unknown for any HCP.[17]

A descriptive study from Landspítali university hospital states that 1/3 of the incidents associated with noncompliance of UWP and 54.7% of needle sticks were associated with hollow bore needles.[18] In our study, all 14 exposures were known HIV seropositive, mainly occurs in the odd hours, in the inpatient wards. Needle stick injuries happened while disposing the hollow bore needles, and glass slides.

Study conducted by M Y Chen et al , emphasize the importance of imparting PEP knowledge from the undergraduate level, and a standard written policy on PEP accessible to HCP.[19] West Bengal based KAP study with interns revealed a wide gap between knowledge and practice of "Standard Precautions" and inadequate knowledge of post-exposure prophylaxis for HIV. They also support the continuous onsite mentoring of interns related to biological waste handling, disposal of medical instruments, supply of equipment.[20]

Cross-sectional study from Manipur tertiary health care centre reveals that poor practice of universal precaution (one third). Three fourth of study subjects attributed this to lack of supply of personal protective equipment, time constraint and work stress.[21] Blood borne infections like HBV, HCV and HIV were mostly effectively prevented by following the standard work precautions but Donna Powers et al study on nurse compliance with Standard Precautions, documented only 17.4% compliance with all items. [22]

Along with all mentioned reports and in present study highlighted the need for scrutiny of daily routine practices of HCPs, universal work precautions and hospital waste management. In house training and mentoring on adherence to universal precautions and appropriate hospital waste disposal should strictly ensured in all medical institutions. All the HCPs should aware of availability of PEP in their hospital, where, when and how to start PEP. This information has to be known to all the HCPs, starting from the medical students to administrators. PEP has to be followed as per the national guidelines; core team implementing the infection control has to be updated as and when the modifications take place.

A prospective study by Falagas et al, focused on the underreporting of percutaneous exposure incidents. It was because of their unwillingness to reveal the incidence or lack of motivation due to the belief that they can handle the issue themselves.[23] Mohammadi N et al KAP study on percutaneous exposure incidents in nurses exposed the junior nurses behaviours were influenced by their seniors' behaviours (inadequate practice of personal protection), perceptions that gloves interfere with nursing procedures or lead to complaints of patients.[24]

An Argentina based study concluded that information on the seropositive status of the source patient did not ensure adherence and PEP programs were unable to guarantee the behaviour change in HCWs. It necessitates personalized programmes for attitude modification, assessment of experience and strategies to improve adherence of HCW.[25] Shevkani, et al, documented that among the HCP started on PEP, 94% have competed the full 28 days course and rest discontinued it for the side effects to PEP regimen.

They emphasized the importance of treating the adverse effects due to PEP, with core concern to complete PEP. An intern was unable to complete the PEP due to adverse effects in our study. These inferences reveal the need of providing the PEP drug without side effects and convenient dosage formulation and for the shortest duration possible.[26]

Side effects should be effectively treated so as to ensure completion of PEP regimen in the exposed individuals. Baggaley et al, states that post exposure prophylaxis (PEP)—effectiveness depends on overcoming barriers to seek services, adequate community understanding and engagement, high levels of access and uptake of services including HIV testing and counselling, and high levels of adherence.[27] World Health Organization reports estimated <1% risk of HIV transmission from an infected patient to a HCP after parenteral or mucous-membrane exposure to blood, which can be further minimized through adherence to routine infection control measures. Various studies discussed the multiple issues in UWP/PEP reporting.

Most of needle stick injuries were under reported. It is because of inadequate knowledge on PEP / UWP, non-adherence to standardized protocols. All the needle stick injuries are to be reported, investigated and followed-up.

Hospital administration has to ensure the safe working environment along with 24 hours availability of protective barriers and PEP drugs in known and easily accessible places like casualty for all HCPs. [28,29]

All the studies, impart the needs of addressing the UWP and PEP in a comprehensive manner. Top level administration to the end implementers like housekeeping workers have to be committed. Availability for the protective equipment, practicing the UWP, training and day to day monitoring and mentoring by the seniors, counselling including the addressing of stigma and discrimination, finally availability of PEP drugs in known reachable places are the key zones in UWP.

CONCLUSION

Prevention is better than cure. We have to follow the Universal Work Precautions (UWP) for all interventions in each and every patient from casualty to ICU, outpatient to inpatient departments, procurement to disposal of instruments. We should emphasize the availability of protective barriers and proper utilization of them by all HCP in any given situations. Conducting in-service training and mentoring on UWP and providing updates for all HCP by the experienced faculty; displaying IEC material in the key areas like OPD, IP, ICU and housekeeping areas are key interventions, to avoid the exposure to blood borne infections.

Limitations of the study

Since this was a retrospective study, we were able to review the available records, unable to retrieve the follow up data. Study limited only with known source of infection (with PLHIV) as per the register. Unknown source of infections and other blood borne infections like HBV, HCV and needle stick injuries in non- infective sources were not documented in our study.

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