

Patterns of Occupational Exposure to Human Immunodeficiency Virus and Post-Exposure Prophylaxis Among Health Care Personnel in a Tertiary Care Institute in South India – A Retrospective Case Series

Abstract

Background: Post-exposure prophylaxis (PEP) for occupational human immunodeficiency virus (HIV) exposure involves the comprehensive measures used to prevent transmission of blood-borne pathogens such as HIV, hepatitis B virus, and hepatitis C virus through various strategies such as first aid, counseling, risk assessment, relevant laboratory investigations with informed consent, the provision of short-term anti-retroviral drugs, and follow-up testing. **Aim and Objectives:** We sought to investigate the patterns and causes of occupational exposure in health care workers (HCWs) in our institute and the usage of PEP in our center, a tertiary care hospital in south India. **Materials and Methods:** The study involved a retrospective analysis of data extracted from the records of PEP usage from the anti-retroviral treatment (ART) center attached to the dermatology, venereology and leprosy out-patient department of a tertiary care center in south India. The data were extracted into a pre-designed proforma and analyzed using descriptive statistics. **Results:** A total of 352 health care professionals reported to the ART center for PEP from 2010 to 2020. One hundred and thirty-four patients took only the first dose as the source patient later tested to be HIV-negative. Among the 218 remaining patients, 84 were male and 134 were female patients. Only 56 health care workers started the regimen within 2 hours. One hundred and thirty-four patients completed the full course of PEP. Most HCWs (n = 68, 31%) sustained the exposure while doing a procedure on the patient followed by re-capping a needle (n = 64, 29%). Gastritis and drowsiness were the most common adverse effects. **Limitations and Conclusions:** The study was limited by the retrospective nature of data collection and the lack of detailed interviews with HCWs. Knowledge about PEP, needle safety training, and training of early first aid measures should be increased among health care workers.

Keywords: Health care personnel, occupational exposure, post-exposure prophylaxis

Introduction

Populations such as individuals engaged in unprotected sexual intercourse, injectable drug users, and health care personnel (HCP) because of occupational exposure are at risk of developing human immunodeficiency virus (HIV) infection. The term health care personnel at risk refers to all paid and unpaid persons serving in health care settings who have the potential for direct or indirect exposure to patients or infectious materials, including body substances (e.g., blood, tissue, and specific body fluids); contaminated medical supplies, devices, and equipment; contaminated environmental surfaces; or contaminated air.^[1] Post-exposure prophylaxis (PEP) is a medical response to prevent transmission of pathogens after potential exposure and refers

to comprehensive management instituted to minimize the risk of infection following potential exposure to blood-borne pathogens. It includes first aid, counseling, risk assessment, relevant laboratory investigations based on the informed consent of the exposed person and source, and depending on the risk assessment, the provision of a short term (28 days) of anti-retroviral drugs, along with follow-up evaluation.^[2] According to CDC, around 384,000 needle stick injuries due to hollow bore needles occur annually in the United States.^[3] The average risk of acquiring HIV infection after a percutaneous exposure to HIV-infected blood is 0.3%.^[2] There is little data regarding the uptake of PEP for preventing HIV infection in this vulnerable population in south India. Hence,

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this retrospective data analysis study was planned to record information on the use of PEP among HCWs in a tertiary care institute in south India.

Materials and Methods

The study involved a retrospective analysis of data extracted from the records of PEP usage from the ART (anti-retroviral therapy) center attached to the dermatology, venereology and leprosy out-patient department of a tertiary care center in south India. After obtaining permission from the Institute Ethics Committee, the data regarding nature of exposure and epidemiological profile of the exposed person were extracted into a proforma, tabulated, and analyzed using descriptive statistics. The ART center catered to HCP from all government centers and private hospitals, including those attached to medical colleges in Pondicherry.

Results

A total of 352 HCWs registered themselves for PEP at the ART center from January 2010 to December 2020. Among these, 134 HCWs took only the first dose on an emergency basis and did not report to the center further as the source person turned to be HIV-negative. Among the remaining 218 patients, 84 (38.54%) were male and 134 (61.46%) were female patients (M:F is 0.62: 1). Most patients belonged to the 18–24 years age group (n = 106, 48.6%), followed by the 25–34 years age group (n = 60, 27.5%). With increasing age, the number of HCWs registering themselves for PEP showed a declining trend. The most common group registering themselves for ART were interns (n = 65, 29.8%), followed by registered doctors, nursing students, sanitary workers, nursing staff, and lab technicians in that order [Table 1].

At least 103 HCWs (47%) did not carry out basic first aid measures such as washing the site of exposure with soap and water [Table 2]. Most HCWs (n = 70, 32%) sought PEP after 2 hrs, within 24 hours. Only one fourth of the HCWs (n = 56, 25%) sought PEP within 2 hours of exposure. Twenty-two percent (n = 49) of HCWs sought treatment within 24–72 hours. Seventeen percent (n = 38) of HCWs sought treatment after 72 hours.

Most HCWs (n = 68, 31%) sustained the exposure while doing a procedure on the patient, and an almost equal number sustained injury while re-capping a needle (n = 64, 29%). Thirty-two HCWs sustained injury while disposing needles and other medical waste. Most HCWs sustained injury by hollow needles (n = 146, 67%). The majority of HCWs had exposure to blood (n = 171, 78%), and very few had exposure to pleural fluid and amniotic fluid. Regarding the status of source, 48 were HIV-reactive, of which 14 were on ART, 24 were not on ART, and the treatment status of 10 was unknown. In most cases (n = 158, 72%), the status of source was unknown. Most HCWs were started on tenofovir, lamivudine, and

Table 1: Demographic profile of HCP

Variable	No (%)
Age	
18-24 years	106 (48.6)
25-34 years	60 (27.5)
35-44 years	42 (19)
Above 45 years	9 (4)
Missing data	1 (0.4)
Sex	
Male	84 (38.54)
Female	134 (61.46)
Occupation	
Doctor	40 (18)
Intern	65 (29.8)
Nursing staff	21 (9.6)
Nursing student	30 (13.7)
Sanitary worker	27 (12.3)
Lab technician	14 (6.4)
Others	21 (10)

efavirenz (TLE) regimen [Table 3]. One hundred and thirty-four HCWs (61%) completed 28 days of PEP drugs. Ninety-eight HCWs were HIV non-reactive at the end of 3 months, and the 55 HCWs who did serological tests at the end of 6 months were non-reactive. The status of the rest was missing. Attempts were made to call the HCWs and remind all of them to do the serology at 3 and 6 months and to notify the center of the result. Although some are meticulous in doing the test, others forget to do it despite reminders. Gastritis and drowsiness were the most common adverse effects.

Discussion

The average risk of acquiring HIV infection after percutaneous inoculation of HIV-infected blood by a needle or any other sharp instrument is 0.3%.^[2] Most HCWs who sought PEP in our study were females, and the most common group was interns [Table 1]. This is similar to a study by Gupta *et al.*^[4] the similarity is probably because both data were from teaching hospitals. Younger HCP were more common (48.6%) among HCP that required PEP. Ninety-five percent of HCWs in the data set published by Gupta *et al.*^[4] reported their exposure within 24 hours, and the median time between exposure and reporting was 30 minutes. In our study, only 58% of HCWs sought treatment within 24 hours, underscoring the need for more awareness about early institution of PEP in our population [Table 2].

Poor utilization of PEP among HCWs has been reported in South Africa.^[5] Poor uptake of PEP despite positive attitude toward PEP was also reported from Nigeria.^[6] According to this study, knowledge of PEP was predicted by previous training, year of training, course of study, and religion. In our study too, 17% of HCWs who were exposed sought treatment only after 72 hours. It is possible that many

Table 2: Details of exposure

Detail	No (%)
Type of contact	
Hollow needle	146 (67)
Solid needle	20 (9)
Splash into eye	17 (7.8)
Contact with skin abrasion	9 (4)
Intact skin	3 (1.3)
Cut with surgical blade	1 (0.4)
Missing data	22 (10)
Source fluid	
Blood	171 (78.4)
Pleural fluid	3 (1.3)
Amniotic fluid	2 (0.9)
Missing data	42 (19)
First aid steps	
Washed with soap and water	81 (37)
Washed with water	15 (6.8)
Applied antiseptic	19 (8.7)
No steps	103 (47.2)
Time to seek treatment	
<2 h	56 (25.7)
2-24 h	70 (32)
24-72 h	49 (22.5)
>72 h	38 (17.4)
Missing data	5 (2)
Circumstance of Injury	
Re-capping of needle	64 (29.3)
Accidentally during procedure	68 (31.2)
Disposing of needles	14 (6.4)
Medical waste disposal	18 (8.2)
Splash	27 (12.3)
Missing data	27 (12.3)

more exposed HCWs did not seek out PEP at all. This is the most probable explanation for the low number of HCWs who sought PEP (352 over 10 years). It has been found in a study that 66.3% of HCP admitted to re-capping needles.^[3] One-third of injuries was because of re-capping of needles in another study.^[7] In our study too, there was a significant number of instances (29% of exposed HCWs) where HCWs admitted to re-capping needles. It is also pertinent to note that, as per our data, 47% of our HCWs did not carry out basic first aid measures such as washing with soap and water soon after exposure. It can be presumed that the importance of repeated periodic training and education about PEP is revealed by these data.

Studies performed on animals show that the risk of sero-conversion among animals exposed to PEP was lowered by 89%.^[8] Immediate use of HIV PEP is believed to reduce occurrence of HIV infection by 80%.^[8] In another study, PEP was started in only one-third of exposures in whom it was required.^[9] In our study, only 61.5% of HCP started on PEP completed 28 days of PEP [Table 3]. The reasons for this are not limited to adverse effects as only 38.9% of

Table 3: Details of treatment

Detail	No (%)
Duration of PEP	
28 days	134 (61.5)
<28 days	53 (24.3)
Not known	31 (14.2)
PEP Regimen	
Basic	28 (12.8)
Expanded	20 (9.2)
TDF, 3TC, EFV	163 (74.8)
TL + LPV/r	2 (0.9)
TL + ATV/r	3 (1.3)
Missing	2 (0.9)
Adverse Effects	
Gastro-intestinal	48 (22)
Headache	4 (1.8)
Drowsiness	32 (14.7)
Increased creatinine	1 (0.4)
None reported	133 (61)
HIV status	
Baseline negative	199 (91)
3 months negative	98 (44.9)
3 months not available	120 (55)
6 months negative	55 (25)
6 months not available	163 (74.7)

TDF: Tenofovir, 3TC: Lamivudine, EFV: Efavirenz, LPV/r: Lopinavir/ritonavir, ATV/r: Atazanavir/ritonavir

HCWs in our data set developed adverse effects. This is comparable to the 31.6% reported by Sheth *et al*^[9]; and is lower than that reported by Shevkani *et al*^[2] (241/278). The need for more training and knowledge could again be the reasons for poor adherence to the PEP regimen. Another study in a similar population in south India revealed that although knowledge was good regarding PEP in HCWs, practice of PEP was quite low.^[10] It was found that HCWs were more likely to accept PEP offered if they were male, which was a contrast to the findings in our study, and if they presented to an academic hospital emergency room.^[11] However, a study from Tanzania found that female HCWs were more likely to use PEP.^[12] A study from Bhutan found that the lack of PEP service and the lack of support to report incidents were reasons for failure of PEP practice among nurses.^[13] HCWs who received training on PEP were four times more likely to adhere to it, according to a study from Ghana.^[14] Around 55% of HCP started on PEP in our study did not report for testing at 3 months, and 75% did not report for repeat enzyme-linked immunosorbent assay for HIV testing at 6 months, reflecting a certain amount of carelessness about the dangerous effects of occupational exposures to body fluids in the health care setting. This could be because of the need for periodic sensitisation and training on PEP in our personnel.

Prior to 2014, WHO (World Health Organization) recommended basic and expanded regimens depending

upon the degree of exposure and status of source. Later, it was changed to a regimen containing tenofovir, lamivudine, and efavirenz (TLE). In case of intolerance to it, instead of efavirenz, a regimen containing lopinavir or atazanavir, boosted with ritonavir, was given. Nearly 75% of the patients in our data set received the TLE regimen, with only few receiving a protease inhibitor-based regimen. After gastro-intestinal effects, drowsiness was the most common adverse effect reported.

Conclusions and Limitations

In conclusion, good training and prior knowledge of PEP appear to be crucial for the good uptake of PEP by exposed HCWs. Occupational safety of HCWs depends upon recommended vaccinations, good knowledge regarding avoidance of dangerous practices such as re-capping of needles, use of appropriate personal protecting equipment, timely application of first aid measures, and early implementation of PEP with good commitment to adherence and follow-up testing. Periodic training to HCWs is important to prevent the burden of disease, financial constraints, and anxiety in HCWs, their families, and the institutions they work in. The limitations of our study are that it is a retrospective collection of data and that we were unable to conduct in-depth interviews regarding awareness with affected HCP. Further qualitative studies having group discussions and in-depth interviews performed at our center will generate more information regarding knowledge and attitude regarding PEP practices in our HCWs. Our study highlights the need for more widespread dissemination of knowledge of all the above measures in HCWs, such that they develop more positive attitude towards utilisation of these measures when required.

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Conflicts of interest

There are no conflicts of interest.

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