Research Article

Knowledge and practice of occupational infections and their prevention among medical interns of a tertiary-care teaching hospital in a south Indian city

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Abstract

Background: Medical interns are a vulnerable group with regard to occupational infections (OI) such as HIV and hepatitis B/C, a large proportion of which are preventable by following universal precautions and to some extent by taking postexposure prophylaxis (PEP).

Objective: To assess the knowledge and practices, regarding OIs, universal precautions, and PEP among medical interns.

Materials and Methods: A cross-sectional study was performed in August 2011 on medical interns of a tertiary-care teaching hospital using a pretested, semi-structured, and self-administered questionnaire. All interns willing to participate (113 of 127 interns) were included.

Results: More than 97.5% respondents were aware of the possibility of infection via mucocutaneous exposure and needlestick injury (NSI), but less than a third were aware of the recommended first aid for such exposures. Only 54% were aware of the recommended procedure of sharp waste disposal; 36.3% interns reported to have had occupational exposure (OE), majority being NSI and suturing being the main associated activity. Less than a fourth were aware of the ideal time to start PEP for HIV and the location of an emergency PEP dose. Around 65% were aware of the maximum time within which PEP should be started and the course duration of PEP. Only one intern reported to have taken PEP.

Conclusion: One of every three interns had OE. Knowledge and practice of measures necessary to prevent OE and OI was poor. Students must be sensitized frequently during the course and before the start of internship using a powerful teaching–learning tool.

KEY WORDS: Occupational infections, occupational exposure, postexposure prophylaxis, universal precautions, standard precautions, needlestick injury

Introduction

Health-care settings pose a major occupational hazard to its employees in the form of occupational infections (OI), among which human immunodeficiency virus (HIV), hepatitis B virus, and hepatitis C virus are the major ones. The transmission occurs following occupational exposure (OE) in the form of percutaneous injury (e.g., a needlestick or cut with a sharp object) or contact of mucous membrane or nonintact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious.[1,2] Among health-care personnel (HCP) in India, nursing staff and medical interns are the most exposed to high-risk body fluids.[3,4]

A large proportion of OIs are preventable by simply following universal precautions and postexposure prophylaxis (PEP) for HIV, but, only if HCPs are aware of these measures, they will be able to protect themselves. For example, only if one is aware that PEP for HIV is most effective if started within 2 h and not effective if given after 72 h will he/she avail the same within the stipulated time; hence, the knowledge of these criteria is of utmost importance to HCPs if they are to protect themselves from OIs.[1,2,5] But, awareness as such cannot prevent OIs, as it is the expression of this knowledge as positive attitude and practices that will contribute to reducing the burden of OI. Our study was undertaken to assess the awareness and practices

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regarding occupational transmission, universal precautions, and PEP among medical interns. More specifically, we were interested to determine the proportion of students who had OE to body fluid over their study course, the circumstances surrounding the exposure, how they reacted to it, and the number of students who took PEP.

Materials and Methods

A cross-sectional study was performed in August 2011 among interns of Bangalore Medical College and Research Institute (BMCRI). All (129) interns who joined in February 2011 and currently in BMCRI and were willing to participate in the study were included. A semi-structured and pretested questionnaire was self-administered to interns at their respective departments.

Results

Of the 129 interns who started internship from February 2011 and currently are at BMCRI, 113 were enrolled for the study with their consent. The mean age was 23 years and comprised 72 (64%) men and 41 (36%) women.

Knowledge of Occupational Transmission

Only 31% (35 of 113) could correctly identify all the high-risk fluids; most were not aware that breast milk and peritoneal fluids are also high-risk fluids. The risk of transmission of HIV through mucous membrane exposure and needlestick injury (NSI) with infected body fluids is 0.09% and 0.3%, respectively.[1] Except for four (3.5%) respondents, all others were aware of the risk of HIV transmission through contact with mucous membrane. All respondents were aware of transmission via NSI.

Knowledge of Recommended First Aid after Occupational Exposure

The recommended measures after mucous membrane exposure are to irrigate with water or normal saline and not to wash with soap or use antiseptics, whereas those after NSI are to allow to bleed gently, wash with soap and water, and not to suck or squeeze the wound.[6] Only 34.5% (39 of 113) and 6.2% (7 of 113) respondents were aware of the recommended first aid to be followed after mucous membrane exposure and NSI, respectively. Application of antiseptic at the site of exposure is shown to have no contribution in reducing the transmission of infection. Many (43.4%; 49 of 113) were of the belief that applying antiseptics reduced transmission; of these, 35% thought that it reduced risk by more than 50%.

Knowledge of Standard Precautions

Standard precautions is a set of measures designed to reduce the risk of transmission of infection in the health-care setting to both the HCP and the patients by limiting exposure of HCP to any body fluid (recognizing the fact that any body fluid may contain contagious and harmful microorganisms). In our study, 70% (78 of 111) respondents were aware of the recommendation that standard precautions should be followed while attending all patients regardless of their diagnosis; others believed that it must be observed only while attending either known or suspected HIV-infected patients. Used needles must be disposed into puncture-proof container with disinfectant and syringes in a separate bin.[5] Only half (54%) the interns were aware of this; 46% believed that used needles must be recapped before disposal.

Practice of Standard Precautions

Standard precautions include hand antisepsis, barrier precautions/personal protective equipment (PPE), safe handling of sharp instruments, cleaning of contaminated surfaces, maintaining hygienic environment, and disposal of biomedical waste. Of these, we could assess the practice of barrier precautions and handling of sharp instruments. Barrier precautions/PPE include gloves, caps, masks, goggles, gowns, and shoes [Table 1]. Fischer's exact test showed a significant association (two-tailed *P*-value = 0.0061, at 95% confidence interval) between the knowledge that "PPE must be used while attending all patients" and the actual practice of the same.

Occupational Exposures

More than a third (36.3%; 41 of 113) of the interns have had OE to high-risk body fluids. Some having been exposed more than once, in all, there were 78 exposures. Of 41 interns who had OE, 6 had eight mucocutaneous exposures, 1 had open

Table 1: Practice of standard precautions: barrier precautions/personal protective equipment

Practice	No. of respondents	Percentage of response
Use of PPE among the 110 interns who responded		
All patients	24	21.8
Only known HIV-infected patients	37	33.6
Suspected HIV-infected patients	49	44.5
Total	110	100
Frequency of use of PPE among the 110 interns who responded		
>90%	10	8.8
<90%	100	91.2
Total	110	100
Reasons for low usage (<90%) of PPE among the 88 interns who responded		
Not always available	56	63.9
Time constraints	15	17
Not necessary to use always	11	12.5
Others	6	6.8
Total	110	100

PPE, personal protective equipment.

Table 2: Details of occupational exposures

	Occupational exposures (episodes)	Percentage
Type of exposure (total = 78)		
Percutaneous—solid needle injury	41	52.6
Percutaneous—hollow-bore needle injury	28	35.9
Mucous membrane exposure	8	10.2
Open wound exposure	1	01.3
PPE use during the exposure (total = 78)		
PPE was not worn during the mishap	30	38.5
PPE was worn during the mishap	45	57.7
Not sure/do not remember	3	03.8
Type of activity leading to the 8 mucocutaneous exposures		
Conducting vaginal delivery	5	62.5
Wound dressing in casualty department	3	37.5
Department-wise distribution of the 78 occupational exposures		
Obstetrics and Gynecology	33	42.3
Medicine	14	17.9
Surgery	11	14.1
Orthopedics	7	9.0
Pediatrics	7	9.0
Casualty	6	7.7

PPE, personal protective equipment.

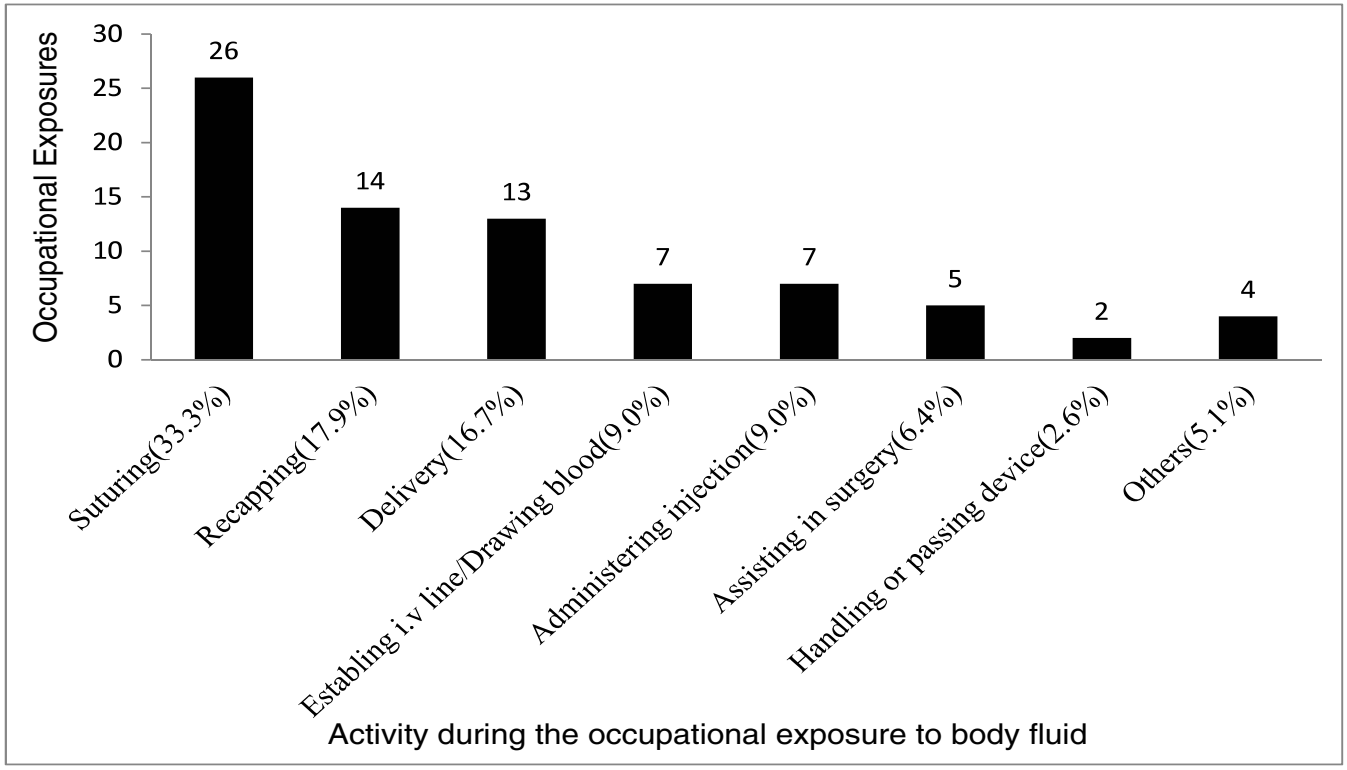

Figure 1: Distribution of the participants according to history of seasonal flu vaccination.

Table 3: Knowledge of postexposure prophylaxis for HIV

Knowledge assessed	Recommendation[6]	Correct response
1. Ideal time to start PEP	Within 2 h of exposure	28 (24.8%)
2. Maximum time to start PEP	72 h from exposure	73 (64.6%)
3. Duration of PEP	28 days	74 (65.5%)
4. Where to avail emergency dose of PEP apart from ART center?	Casualty, labor ward	20 (17.7%)
5. Is PEP 100% effective?	PEP is not 100% effective	83 (73.5%)
6. Drugs used in PEP: respondent could name		
At least one drug used for PEP	Zidovudine (AZT) (or) stavudine (d4T) + lamivudine (3TC); AZT or d4T + 3TC + lopinavir or ritonavir or nelfinavir or indinavir	95 (84.1%)
At least one drug combination of the "basic regimen"		51 (45.1%)
At least one drug combination of the "expanded regimen"		09 (8.0%)
7. Regarding HIV testing		
Before PEP	Is necessary but not mandatory both before and after PEP	54 (47.8%)
After PEP		93 (8.3%)

PEP, postexposure prophylaxis; PPE, personal protective equipment.

wound exposure, and the remaining 34 had NSIs [Table 2]. Obstetrics and Gynecology, General Medicine, and General Surgery were the most risky departments, together accounting for 75% (58 of 78 exposures) of OEs [Table 2]. The most risky activities were suturing, recapping of injection needles, and conducting vaginal delivery; together these activities were responsible for 67.9% (53 of 78 exposures) OEs [Figure 1].

First-Aid Practices for Occupational Exposure

Four of the seven interns who had mucous membrane exposure followed the recommended procedure of irrigating with water or normal saline. One intern had open wound exposure to amniotic fluid. He followed the recommended procedure of washing with soap and water.[5–7] Only 5 of 34 interns who had NSIs followed the recommended first aid of allowing to bleed gently and washing the wound with soap and water, but unfortunately, all the 5 interns have also squeezed the wound.[5–7] Hence, per recommendations, we may conclude that none of the interns followed the correct first aid and put themselves at risk of infection.

Knowledge of Postexposure Prophylaxis for HIV

The HIV status of the source/patient was known or an effort in getting to know the same was taken for 67.9% (53 of 78 OEs) OEs, by 68.3% (28 of 41) respondents who had OEs; of these, only 2 OE sources turned out to be positive for HIV [Table 3]. An assessment of the emergency/casualty department and labor ward for the availability of emergency dose of ART showed that adequate stock of ART within expiry period was available in both the places.

Source of Knowledge of PEP

The major source of interns' knowledge (85%; 96 of 113 interns) was academic teaching activity namely the "visit to ART center" organized by the Department of Community Medicine. Few interns had actually read literature on PEP.

Practice of PEP

Only one intern had taken PEP; he started PEP after 2 h but within 36 h of the single NSI that he had while suturing. He reported to have squeezed the wound and applied antiseptic. The first dose of PEP was taken from the ART center. He successfully completed 28 days of the course. Nausea was the only adverse drug reaction he experienced.

Discussion

The consolation for the several deficiencies in their knowledge of OI, universal/standard precautions, and PEP is the fact that all interns were aware that disease transmission occurs via NSI, and almost all (96.5%) were aware of transmission through mucocutaneous exposure. Hence, regardless of the conclusion from this study, we can at least expect the interns to be at caution of exposure. The awareness of occupational transmission is better than other foreign studies as was seen in a similar population in Venezuela, which had 94.68% awareness.[8] In our study, less than a third of the subjects could correctly identify high-risk body fluids. In a study on anesthetists in the UK by Diprose et al.,[9] 45.2% could correctly identify high-risk body fluids.

The risk of transmission of OI can be reduced by following simple first-aid techniques. On exposure of mucocutaneous surface or open wound to high-risk body fluids, one should irrigate with water or normal saline. After accidental NSI, one must allow to bleed gently and wash with soap and water.[1,6] Only when the HCP is aware of these simple techniques, he/she can reduce the risk. The awareness regarding these

techniques is very poor among the interns as only 15% and 6.2% knew the recommended first aid for mucous membrane exposure and NSI, respectively. The misconception that applying antiseptics reduced transmission was quite prevalent (47%); this misconception can lead to neglect of PEP. These findings are much better when compared with those of a study in Iran in which more than 90% of the surgeons and surgical interns believed that applying antiseptic reduced transmission.[10] Diprose et al.[9] found better results among anesthetists, as 68% of them were aware of the correct first aid after NSI.

Despite a good number of interns (70%) being aware that standard precautions should be followed while attending all patients, very few actually practiced the same, as only 21.8% used PPE while attending all patients. An even smaller proportion of interns (8.8%) used PPE more than 90% of the times. The reason for this low usage of PPE was mainly attributed to nonavailability of PPE. Gupta et al.[11] noted PPE use of 55.1% among interns in Pune, India.

Improper disposal of needles and syringes leads to NSI. Only half the interns were aware of the recommended sharp waste disposal technique. Half the interns also mentioned recapping of needles as the recommended technique before disposal. Askarian et al.[10] reported a similar level of misconception, 44.4% medical interns in a medical school in Iran believed that needles must be bent before disposal.

More than a third of the interns reported to have had at least one OE. Nearly 90% of these were NSI, suturing being the main activity associated with NSI, and 60% of exposures occurred when PPE was not used. The department with the highest OE was Obstetrics and Gynecology, on account of episiotomy suturing and mucocutaneous exposure to amniotic fluid while assisting vaginal delivery. Cervini and Bell[13] found a similar proportion of NSI in their study on medical students in Toronto, Canada, and suturing accounted for majority (46%) of NSIs and solid needle was the most common instrument (69%) causing NSI; but unlike the findings from our and many other Indian studies, this study reported that only 6% of the exposures occurred while not wearing PPE. In an Indian study, Gupta et al.[14] reported 81.1% percutaneous (77.0% exposures were because of handling a sharp and recapping specifically accounted for 8.3% exposures) and 18.8% mucocutaneous exposures among medical students. Jayanth et al.[4] in their study in Vellore, India, on hospital staff including interns found that most NSIs occurred when standard precautions were not followed (75%), but contrary to our study, here the most common activity leading to NSI was blood collection, and as a result, the most common instrument was hollow-bore needle. Hanafi et al.[15] in their study in Alexandria, Egypt, on a similar group as the Vellore study also found that hollow-bore needle (38%) and recapping or disassembly of syringe (36%) were the most common instrument and activity, respectively, which were associated with NSI.

PEP is most effective when taken within 2 h of exposure; the effectiveness decreases with delay and is ineffective after 72 h of exposure. Only a fourth of the interns were aware of the ideal time to start PEP. These findings were better than those of a study on anesthetists in the UK, wherein only 15% were aware that PEP must be commenced as soon as possible.[9] Most interns (79%) were aware that PEP is available in ART centre, which functions as an "outpatient department" for fixed work hours during the daytime and only on working days. An HCP with an OE any time apart from these timings would have to wait till the next working day for a dose of PEP. Hence, emergency dose of PEP must be made available in the casualty and labor room of every hospital, and the awareness of the same among all HCP is quintessential. Only 18% interns were aware of these locations; the rest will consequently delay to start PEP.[9] Our study group is not alone in this regard as studies on specialists in developed countries have shown the same. A study on surgeons in the USA found that only 2 of the 26 interviewee were aware about from where to get an emergency dose of PEP.[14] Poor awareness of PEP also reflected in their practice, as only 1 of the 41 interns (or 78 exposures) took PEP.

Although most interns are aware of the risk of occupational transmission, their knowledge of measures necessary to prevent such exposures, that is, standard precautions, and of measures necessary to reduce risk of transmission after such an exposure namely PEP is poor. Poor knowledge of first aid after OE also reflected in their practices. The major source of interns knowledge was the "visit to ART center," as this is done during second or third year of the four-and-a-half-year medical course, and if not followed by any evaluation, there is a good possibility that the knowledge gained during this visit is forgotten. Continued medical education program on this aspect directed at interns and conducted before the start of internship may be a useful tool to spread awareness. Good hospital management, which includes ensuring availability of PPE, will definitely contribute to reduction in OE. These findings underscore the importance of the "Hospital Infection Control Committee," which should shoulder the responsibility of enforcing necessary corrective measures.

Conclusion

One of every three interns had OE. Knowledge and practice of measures necessary to prevent OE and OI was poor. Students must be sensitized frequently during the course and before the start of internship using a powerful teaching–learning tool.

References

1. Panlilio AL, Cardo DM, Grohskopf LA, Heneine W, Ross CS, Centers for Disease Control and Prevention. Updated US Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis. MMWR Recomm Rep 2005;54(RR-9):1–17.
2. Safe Injection Global Network, World Health Organization. *SIGN 2010: Annual Meeting of the Safe Injection Global Network*. Report of the SIGN2010 Meeting. Dubai, November 9–11, 2010. pp. 4–41.
3. Bhat G, Patnaik B, Pratinidhi A, Gupte A, Desai A. Knowledge and awareness amongst the nursing students regarding risk of HIV infection through accidental needlestick injury. Indian J Commun Med 2004;29(3):143–4.

4. Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G. Needle stick injuries in a tertiary care hospital. Ind J Med Microbiol 2009;27(1):44–7.
5. Sridhar MR, Boopathi S, Lodha R, Kabra SK. Standard precautions and post exposure prophylaxis for preventing infections. Indian J Pediatr 2004;71(7):617–26.
6. National AIDS Control Organisation, Ministry of Health & Family Welfare, Government of India. *Antiretroviral Therapy Guidelines for HIV-Infected Adults and Adolescents Including Post-exposure Prophylaxis*. New Delhi, India: NACO, 2007. Available at: www.nacoonline.org (last accessed on March 13, 2013).
7. Department of Health & Human Services, Center for Disease Control and Prevention. *Exposure to Blood What Healthcare Personnel Need to Know*. Atlanta, GA: CDC, 2003.
8. Monsalve Arteagaa LC, Martínez Balzanoa CD, Carvajal De Carvajal AC. Medical students' knowledge and attitudes towards standard precautions. J Hosp Infect 2007;65(4):371–2.
9. Diprose P, Deakin C, Smedley J. Ignorance of post-exposure prophylaxis guidelines following HIV needlestick injury may increase the risk of seroconversion. Br J Anaesth 2000;84(6):767–70.
10. Askarian M, Mclaws M, Meylan M. Knowledge, attitude, and practices related to standard precautions of surgeons and physicians in university-affiliated hospitals of Shiraz, Iran. Int J Infect Dis 2007;11:213–9.
11. Duff S, Wong C, May R. Surgeons' and occupational health departments' awareness of guidelines on post-exposure prophylaxis for staff exposed to HIV: a telephone survey. BMJ 1999;319:162–3.
12. Reda A, Vandeweerd J, Syre T, Egata G. HIV/AIDS and exposure of healthcare workers to body fluids in Ethiopia: attitudes toward universal precautions. J Hosp Infect 2009; 71(2):163–9.
13. Cervini P, Bell C. Brief report: needlestick injury and inadequate post-exposure practice in medical students. J Gen Intern Med 2005;20:419–21.
14. Gupta A, Anand S, Sastry J, Krisagar A, Basavaraj A, Bhat SM, et al. High risk for occupational exposure to HIV and utilization of post-exposure prophylaxis in a teaching hospital in Pune, India. *BMC Infect Dis* 2008;8:142.
15. Hanafi MI, Mohamed AM, Kassem MS, Shawki M. Needlestick injuries among health care workers of University of Alexandria hospitals. East Mediterr Health J 2011;17(1):26–35.

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