Reporting and case management of occupational exposures to blood-borne pathogens among healthcare workers in three healthcare facilities in Tanzania

Journal of Infection Prevention
2016, Vol. 17(4) 153–160
DOI: 10.1177/1757177416645343
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Abstract

Background: In sub-Saharan Africa, blood-borne pathogens exposure (BPE) is a serious risk to healthcare workers (HCW).

Methods: We conducted a cross-sectional study assessing BPE among HCW at three public hospitals in Tanzania. From August to November 2012, HCW were surveyed using Audio-Computer Assisted Self-Interview. All HCW at risk for BPE were invited to participate. Factors associated with reporting BPE were identified using logistic regression.

Findings: Of the 1102 eligible HCW, 973 (88%) completed the survey. Of these, 690 (71%) were women and 499 (52%) were nurses and nurse assistants. Of the 357 HCW who had a BPE (32%) in the previous 6 months, 120 (34%) reported it. Among these 120 reported exposures, 93 (78%) HCWs reported within 2 h of exposure, 98 (82%) received pre- and post-HIV test counselling, and 70 (58%) were offered post-exposure prophylaxis (PEP). Independent factors associated with reporting BPE were being female (adjusted odds ratio [AOR], 2.0; 95% confidence interval [CI], 1.2–3.5), having ever-received BPE training (AOR, 2.0; 95% CI, 1.2–3.5), knowledge that HCW receive PEP at another facility (AOR, 2.6; 95% CI, 1.5–4.4), low/no perceived risk related to BPE (AOR, 4.2; 95% CI, 1.9–9.4) and HIV testing within the past year (AOR, 2.3; 95% CI, 1.2–4.4).

Conclusion: These results highlight the importance of appropriate training on the prevention and reporting of occupational exposure to increase acceptance of HIV testing and improve access to PEP after BPE.

Keywords

Blood-borne pathogen exposures, Africa, post-exposure prophylaxis, reporting

Date received: 21 September 2015; accepted: 27 March 2016

Background

Blood-borne pathogens exposures (BPE) caused by percutaneous injuries (i.e. needlestick or other sharps injuries) or other exposures of contaminated blood or body fluids onto mucous membranes or non-intact skin pose a serious risk to healthcare workers (HCW). Worldwide, it has been estimated that more than 3 million HCWs experience percutaneous injuries with a contaminated sharp object each year, and approximately 90% of injuries occur in developing countries (Pruss-Ustun et al., 2005).

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The high burden of HIV in sub-Saharan Africa and lack of standardised and universal occupational safety measures and supplies result in BPE being a serious threat to the already understaffed and overburdened healthcare workforce (Kane et al., 1999; Simonsen et al., 1999; Vaid et al., 2013). Studies conducted at health facilities in sub-Saharan Africa have observed high rates of needlestick injuries. One study from Kenya revealed that HCWs sustain approximately one needlestick injury per year per worker (Taegtmeyer et al., 2008). A high rate of needlestick injuries (4.18 per person-year) was also observed among the nursing staff at a national referral hospital in Uganda; 57% had experienced at least one needlestick injury in the last year and only 18% had not experienced an injury in their entire career (Nsubuga and Jaakkola, 2005). A recent study conducted in two hospitals in Tanzania observed that nearly half of the HCWs had experienced at least one occupational injury in the past 12 months (Mashoto et al., 2013).

In addition to expanding the use of Standard Precautions (Siegel et al., 2007), prompt reporting and documentation of BPE is crucial to identify workplace hazards and evaluate preventive measures. Reporting and documentation are necessary for implementation of post-exposure prophylaxis (PEP) to prevent blood-borne pathogen infection, including HIV and hepatitis B (HBV) (Beltrami et al., 2000). If administered promptly, the efficacy of available PEP regimens is approximately 81% for HIV (Cardo et al., 1997) and 85–95% for HBV, when using a combination of hepatitis B Immune Globulin (HBIG) and vaccine series (U.S. Public Health Service, 2001). However, underreporting of occupational exposures is a serious problem for HCW safety worldwide, with reporting rates ranging from as low as 11% to 77% (Elder and Paterson, 2006; Nwankwo and Aniebue, 2011; Osazuwa-Peters et al., 2013; Zawilla and Ahmed, 2013).

In Tanzania, with an HIV prevalence of 5.1% among adults aged 15–49 years (Tanzania Commission for AIDS [TACAIDS] et al., 2013), a recent study in two hospitals observed that nearly half of the HCWs had experienced at least one occupational injury in the past 12 months (Mashoto et al., 2013). However, limited data on the frequency of BPE and reporting and case management practices are available in Tanzania. The objective of this study was to describe HCW reporting rates of occupational BPE and satisfaction with the reporting and case management system at three public health hospitals in Tanzania, before a multi-level intervention was introduced to increase reporting of BPE and improve the case management system.

Methods

Study design

We conducted a cross-sectional study assessing experiences of occupational BPE, history of BPE reporting and

use of PEP among HCW at three public hospitals in Tanzania between August and November 2012. The three hospitals were selected using convenience sampling from among public-sector general hospitals operating at the secondary level of care near Dar es Salaam. These facilities are located in urban areas which serve as regional referral hospitals receiving patients from the district hospitals, health centres and dispensaries in the respective regions and have capacities in the range of 255–450 inpatient beds. The three health facilities have various service units providing inpatient and outpatient services, including professional cadres and medical attendants who are involved in providing health services within the hospitals units.

Ethical considerations

This study was approved by the National Ethics Review Committee of the Tanzanian National Institute for Medical Research, the Columbia University Medical Center Institutional Review Board (IRB) and the U.S. Centers for Disease Control and Prevention IRB. Verbal consent was obtained from each participating HCW. No identifying information was collected during the survey. No incentives were provided for participation.

Study population

All HCWs at risk for occupational exposure to blood-borne pathogens at these three facilities who were aged 18 years or over, able to provide informed consent, and could read and comprehend English or Swahili were eligible to participate. HCWs at risk for occupational exposure to blood-borne pathogens included the following cadres currently employed or receiving training at the facility: doctors, medical officers, nurses, dentists, janitors, interns, students, mortuary workers, incinerator operators, cleaners, waste handlers and laundry workers. In collaboration with the management team at the facilities, a list of potential eligible HCWs was developed and HCWs were invited to participate in the survey.

Data collection

Data were collected using Audio-Computer Assisted Self-Interview (ACASI) which was loaded onto encrypted password-protected tablets which had been programmed using the Questionnaire Development System (QDS) software (Nova Research Company, Bethesda, Maryland, USA). The questionnaire was programmed to include skip patterns and internal data checks to avoid implausible answers. Data collected were automatically saved into an encrypted and password-protected database and backed up daily onto a secure external hard drive.

After obtaining informed consent, HCWs were given the tablet to complete the survey confidentially. The survey included

closed-ended questions on HCW characteristics, perceptions, attitudes and experiences with occupational exposures, reporting and post-exposure care. The questionnaire was available in English and Swahili and was screened for acceptability and comprehension prior to implementation. The survey was designed to be completed within 30 min, but duration varied depending on participant response and comfort with the tablets.

Review of reporting documents and data abstraction

In addition to a HCW survey, in each facility, the availability and content of documents related to BPE were reviewed using a standardised checklist. Specifically, the availability of the national tools, standardised operating procedures to manage BPE, algorithms for reporting and management, and registers of HCW reporting and PEP administration within each facility was determined. Abstraction of BPE reported data from the 6 months prior to the survey was conducted to determine the documented number of BPE reported.

Statistical analysis

Simple descriptive analyses were conducted on data aggregated from the three facilities to identify frequencies of documented and self-reported needlestick injuries and splashes and overall satisfaction with the system. Descriptive analyses included the numbers and percentages of HCW who experienced occupational BPE in the last 6

months, reported the exposure within 2–4 h of the incident, underwent a formal evaluation of exposure risk within 2–4 h of the incident, and received HIV testing and pre- and post-HIV test counselling as part of their case management. Variables associated with: (1) having an exposure in the past 6 months and (2) reporting a BPE were assessed using logistic regression in bivariate analyses. Variables significant at the 0.10 level were included in the multivariate analysis and controlled for a range of relevant factors including sex, HCW cadre and duration of employment. Variables not significant at the 0.05 level were removed from the final model. Statistical analyses were conducted using SAS, version 9.3 (SAS Institute, Cary, NC, USA).

Results

Study population

Overall, 1102 eligible HCWs were identified at the three facilities and were given an appointment to participate in the survey. Of these, 973 (88%) completed the survey, 128 (12%) did not present for the survey appointments after three different attempts to contact them, and one declined to participate after reading the informed consent (Figure 1). Of the 973 who completed the survey, 690 (71%) were women, 53% were aged 21–39 years and 499 (51%) were nurses (Table 1). More than half ($n = 521$) had been working at their respective facilities for more than 5 years, and 666 (68%) were full-time employees. Fifteen percent

Figure 1. Self-reported blood-borne pathogen exposure, reporting and use of post-exposure prophylaxis among eligible study participants.

Table 1. HCW characteristics among those completing a survey, stratified by having an exposure in the past 6 months.

	Total (N = 973)		Had an exposure in the past 6 months (N = 357)		Did not have an exposure in the past 6 months (N = 616)	
	n	%	n	%	n	%
Sex						
Female	690	71	244	68	446	72
Male	283	29	113	32	170	28
Age (years)						
≤20	26	3	7	2	19	3
21–39	518	53	206	58	312	51
≥40	429	44	144	40	285	46
Job title						
Medical doctor/clinical officer	108	11	65	18	43	7
Nurse/Nurse Assistant	499	52	173	49	326	53
Other professionals	99	10	30	8	69	11
Support workers	124	13	37	10	87	14
Student/Intern	143	15	52	15	91	15
Years working in this facility						
≤1	163	17	62	17	101	16
1–5	289	30	105	29	184	30
>5	521	54	190	53	331	54
Employment status						
Full-time	666	68	248	69	418	68
Part-time/Casual	106	11	41	11	65	11
Student	201	21	68	19	133	22
Perceived risk related to BPE						
High	470	48	193	54	277	45
Medium	353	36	125	35	228	37
Low/No risk	150	15	39	11	111	18
Ever received training on occupational exposures						
Yes	660	68	238	67	422	69
No/Don't remember	313	32	119	33	194	31
Ever tested for HIV*						
Yes	864	89	326	91	538	87
No/Don't remember	108	11	30	8	78	13

No significant differences were observed between both groups.

*One participant did not complete this question due to early termination of the survey.

(n = 150) perceived they were at low or no risk for BPE, while 36% (353) considered they were at medium risk for BPE. More than two-thirds (68% [n = 660]) had received a training on the prevention of BPE, with 38% (n = 254) of them receiving the last training less than 12 months ago.

Although the majority were aware that HIV can be transmitted by sharps injury or splashes (82%), only 48% and 21% were aware that hepatitis B and hepatitis C can also be transmitted by BPE, respectively. The vast majority of HCW surveyed (864/973, 89%) had ever been tested for

HIV, of which 51% had been tested in the past 6 months and almost half (48%) had been tested for HIV at the facility where they were currently employed. Among the reasons for HIV testing, 38% (327/864) said it was because they were working in a setting with high risk for HIV.

The majority of HCW were aware of the availability of PEP services at the facility (883/973; 91%), but only 666 (75%) were aware that it is available 24 h a day, 7 days a week. Only 147 (15%) reported having previously received at least one dose of hepatitis B vaccination.

Experiences with occupational exposures

Overall, 357 (37%) had ever experienced a percutaneous needle or sharp injury, while 407 (42%) had ever had a blood or body fluid splash. Additionally, 42% and 38% were aware of co-workers having a sharp injury or splash, respectively (data not shown). In the past 6 months, 146 (15%) reported having a sharp injury, 283 (29%) having a splash and 357 (37%) having at least one exposure (sharp or splash). The characteristics of HCWs stratified by whether they had an exposure in the past 6 months are presented in Table 1. No statistically significant differences were observed when analysing whether an exposure occurred in the past 6 months by HCW characteristics.

Reporting practices and experiences with post-exposure care

Of the 357 HCW who had a BPE in the past 6 months (sharp injury or splash), 120 (34%) reported the exposure. Although not statistically significant, the proportion reporting an exposure varied by HCW cadre, with a higher proportion reporting among nurses (38%), support workers (35%) and students (31%) (data not shown) compared with 25% of doctors and medical officers reported the exposure. Half reported to a senior worker or supervisor (52%), 19% to infection control staff and 15% to the HIV counsellor. Among the 120 reported exposures, 93 (78%) HCW reported within 2 h of exposure, 20 (17%) between 2 and 24 h, and seven (6%) after 24 h.

The main reasons given to report a BPE were thinking the patient they were caring for was HIV-positive (33%), wanting to test for other infections (16%), knowing the patient they were attending was HIV-positive (14%), feeling it would help them (10%) or seeking an HIV test (9%). On the other hand, among the 208 that did not report the BPE, the main reasons were that the needle or sharp implicated in the exposure was unused (30%), a perception that the exposure was not serious (15%), being unaware that they should report (13%), not wanting to report due to side effects of PEP (10%) or because they thought no system for reporting BPE at the facility (8%) was available.

Most HCWs who reported (98/120; 82%) said they received an initial HIV test and counselling. Of these, 70/98 (71%) had at least one follow-up HIV test after the first visit, 52/98 (53%) at 6 weeks, 54/98 (55%) at 3 months and 45/98 (47%) at 6 months following the initial report. Of the 120 who reported, 70 (58%) were offered PEP, of which 97% completed PEP (Figure 1). Eighty percent of those HCW who reported did not lose any workdays due to the BPE, with only eight (7%) losing more than 2 days of work. Two-thirds (68%) of the 120 HCWs who reported a BPE exposure were satisfied with the overall post-exposure care experience, 20% were unsatisfied, 8% neither satisfied nor dissatisfied and 4% did not know.

Factors associated with reporting an exposure

Bivariate and multivariate factors associated with reporting an exposure are presented in Table 2. Independent factors associated with reporting BPE were being female vs. male (adjusted odds ratio [AOR], 2.0; 95% confidence interval [CI, 1.2–3.5), having ever-received BPE training vs. no training (AOR, 2.0; 95% CI, 1.2–3.5), knowledge that HCWs can receive PEP at another facility vs. no knowledge (AOR, 2.6; 95% CI, 1.5–4.4), low/no perceived risk related to BPE (AOR, 4.2; 95% CI, 1.9–9.4) and high perceived risk related to BPE (AOR, 2.3; 95% CI, 1.3–4.0) and HIV testing within the past year vs. no testing in the past year (AOR, 2.3; 95% CI, 1.2–4.4).

Documentation of BPE reporting at the facilities

At the time of data collection, due to lack of national tools, each health facility had developed their own registers to capture both occupational and non-occupational exposures. The total number of occupational BPE documented in the registers during the 6 months prior to the survey was 14 in the three facilities. Only one of the facilities had a process whereby they receive and review monthly summary reports by the HIV care and treatment clinic in charge. Additionally, there was no reported data from the health facilities at the national level which could provide a summary of BPE data, such as frequency and annual HCW occupational exposures.

Discussion

This study describes the frequency of BPE, reporting practices and case management system at three public hospitals in Tanzania. Among the HCW surveyed, 37% had an occupational exposure (sharps injury or splash) in the past 6 months. However, only one-third of those sustaining a BPE reported the exposure, with medical doctors reporting least frequently of all the cadres participating in the survey. Several reasons were identified for not reporting an exposure, with almost one-quarter lacking knowledge in the reporting procedures at the facilities. Nevertheless, the majority of those that reported were satisfied with the overall post-exposure care experience. Despite the low cost and effectiveness of the hepatitis B vaccine, very few (15%) received at least one dose of vaccine since the vaccine is not routinely available.

We observed several factors that might contribute to the high proportion of exposures at these facilities, including lack of supplies for infection prevention control (gloves, face masks), shortage of staffing, lack of engineering controls such as safer needle devices, lack of awareness of hazard and lack of training. The implementation of education,

Table 2. Factors associated with reporting an exposure among HCWs in Tanzania.

	Reported the exposure (n = 120)		Did not report/Does not remember (n = 237)		OR	95% CI	AOR	95% CI
	n	%	N	%				
Sex								
Male	25	21	88	37	1		1	
Female	95	79	149	63	2.2	1.3–3.8	2.0	1.2–3.5
Age (years)								
≤20	4	3	3	1	3	0.6–13.6		
21–39	64	53	142	60	1			
>40	52	43	92	39	1.3	0.8–2.0		
Job title								
Medical doctor/officer	16	13	49	21	1			
Nurse/Nurse Assistant	65	54	108	46	1.8	1.0–3.5		
Other professionals	10	8	20	8	1.5	0.6–3.9		
Support workers	13	11	24	10	1.7	0.7–4.0		
Student/Intern	16	13	36	15	1.4	0.6–3.1		
Years working in this facility								
<1	22	18	40	17	1			
1–5	31	26	74	31	0.8	0.4–1.5		
6–10	19	16	39	16	0.9	0.4–2.1		
11–15	12	10	25	11	0.9	0.4–1.9		
>15	36	30	59	25	1.1	0.6–2.2		
Employment status								
Full-time	85	71	163	69	1			
Part-time/Casual	10	8	31	13	0.6	0.3–1.3		
Student	25	21	43	18	1.1	0.6–2.0		
Ever received training on occupational exposures								
Yes	90	75	148	62	1.8	1.1–2.9	2.0	1.2–3.5
No/Don't know	30	25	89	38	1		1	
Perceived risk related to BPE								
High	72	60	121	51	2.1	1.2–3.4	2.3	1.3–4.0
Medium	28	23	97	41	1		1	
Low/No risk	20	17	19	8	3.7	1.7–7.8	4.2	1.9–9.4
Aware that HCW could visit another site for PEP services								
Yes	94	78	137	58	2.6	1.6–4.3	2.6	1.5–4.4
No/Don't know	26	22	99	42	1		1	
Last time HIV tested								
≤1 year	97	81	161	68	1		1	
>1 year	15	13	46	19	0.5	0.3–1.0	0.4	0.2–0.9
Don't remember	2	2	5	2	0.7	0.1–3.5	1	0.2–5.7
Missing values	6	5	25	11	–	–	–	–

universal precautions, elimination of needle recapping and use of sharps containers for safe disposal have reduced considerably sharp injuries in other settings and could be useful strategies to be implemented in Tanzania (Wilburn and Eijkemans, 2004). Despite their high risk of HCW for

hepatitis B infection, Tanzania has not yet implemented a nationwide vaccination campaign for hepatitis B among HCW (World Health Organization, 2013). Vaccination of HCW for hepatitis B would also be a cost-effective measure to protect HCW at high risk of exposure in Tanzania

and should play a large role in prevention strategies (Centers for Disease Control and Prevention (CDC), 2001).

In recent years, the Ministry of Health of Tanzania, supported by non-government implementing partners, has made considerable efforts to improve standard precautions to reduce the occurrence of BPE. This could explain the lower proportion having a BPE in the past 6 months found in this study compared to what has been reported in previous studies conducted in Tanzania (Chagani et al., 2011; Gumodoka et al., 1997; Mashoto et al., 2013). In contrast to other studies, our sample included all eligible HCW at risk for BPE, including non-clinical staff such as cleaners and workers operating incinerators who reported less BPE in the past 6 months than nurses, doctors and medical officers and might have lower risk. Though the proportion reporting a BPE is lower than previous studies, there are still substantially high numbers of HCW at high risk which underscores the importance of effective strategies to reduce the number of BPE as well as prompt reporting and appropriate post-exposure management.

Of those that had an exposure in the past 6 months, only 34% of HCW reported the exposure, which is similar to what other studies in sub-Saharan Africa have observed (Kassa et al., 2014; Nwankwo and Aniebue, 2011; Osazuwa-Peters et al., 2013). Interestingly, doctors and medical officers least frequently reported the BPE, although they had the highest rate of exposures. Anecdotal evidence from healthcare providers suggests that underreporting of BPE by doctors could be explained by the fact that doctors usually have access to medication and could easily obtain drugs for PEP. Targeted efforts to improve reporting among this group are urgently needed.

Among the main reasons for not reporting an exposure, almost one-quarter were due to lack of knowledge in the reporting practices at the facilities consistent with other studies which have made similar observations (Mangione et al., 1991; Mashoto et al., 2013; Nsubuga and Jaakkola, 2005). The lack of training of HCW on prevention and management of occupational exposures and PEP among HCW has been described in resource-limited settings (Gupta et al., 2008; Kumakech et al., 2011). Lack of awareness could be addressed with appropriate and routine trainings on standard precautions, reporting and post-exposure care. In fact, we observed that HCW who had ever received a BPE training had twice the odds of reporting when compared to those that did not have similar training highlighting the importance of adequate training. As expected, higher perceived risk of BPE was associated with higher odds of reporting an exposure when compared to medium risk. However, and quite surprisingly, higher odds were also observed among those that reported low or no risk to BPE versus medium risk.

We also observed a discrepancy between the numbers of HCWs who responded that they had reported an exposure in comparison to the number of documented exposures in the facilities.

This may be due to the lack of maintenance of reporting registers at the time the survey was conducted. Recently the Tanzania MOHSW has developed new draft of the Infection Prevention Control guidelines, which include tools for the reporting management of occupational and non-occupational exposures. Among these new tools are a register at the facility level to capture occupational and non-occupational exposures (e.g. rape) and monthly summary forms for reporting to the national level. These tools are currently being rolled out for use at the health facilities and will likely contribute to improved reporting and awareness, reporting and documentation of BPE in Tanzania.

One of the strengths of our study is that, in comparison with most studies on occupational exposures, all HCW at risk for BPE were invited to complete the survey, including interns, students and non-clinical HCW (e.g. laundry staff, janitors, incinerator workers). Interns and students have been found to be at higher risk of BPE, possibly due to their limited experience performing some of the clinical tasks, although few studies include them in their sampling (Osazuwa-Peters et al., 2013). Additionally, non-clinical HCW are also at risk for occupational exposures during their routine activities, although they are possibly left out of trainings for prevention measures and are less familiar with the importance of reporting exposures immediately.

This study is subject to the following limitations. The study was conducted at three public hospitals near Dar es Salaam, and the experiences described by the HCW may not be generalisable to all healthcare settings in the country. Additionally, data were collected through self-report and social desirability or recall bias may have resulted in under-reporting of the number of injuries incurred and over reporting their reporting practices. These biases were likely minimised through the use of ACASI to complete the survey but the impact on the results cannot be quantified.

In conclusion, despite progress, this study highlights the need to improve reporting and case management system in Tanzania, including routine trainings and workshops on standard precautions and reporting of exposures for timely post-exposure care. The review of data from the registers and reporting tools developed as part of the new Infection Prevention Control guidelines at the facility, district and national level will likely contribute to the prevention of blood-borne pathogen infection among HCWs through occupational exposures. The low proportion of HCWs vaccinated for hepatitis B in these three facilities highlights a clear and cost-effective intervention opportunity to protect HCWs. Finally, multi-level interventions aiming to improve reporting practices and create a supportive environment for reporting BPE are urgently needed to protect HCW working in regions with high HIV prevalence.

Acknowledgments

We thank the HCWs who participated in this survey as well as the management staff from the three health facilities.

We acknowledge the efforts of the ICAP staff who facilitated data collection used for this analysis. We also thank the members of the Pathways to PEP collaboration in Tanzania.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research has been supported by the President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Centers for Disease Control and Prevention (CDC) under the terms of Cooperative Agreement (grant number CDC ESIS 200-2011-37935). The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Peer review statement

Not commissioned; blind peer-reviewed.

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