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Occupational exposure to HIV: a conflict situation for health workers

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Aim: To determine the frequency of occupational exposure to human immunodeficiency virus (HIV), the circumstances and predisposing factors, the high-risk groups, the extent to which exposures are reported and the post-exposure prophylaxis (PEP) utilized by health-care workers (HCWs) and students in a Ugandan hospital.
Background: Occupational exposure to HIV is a low but potential risk of HIV infection to health workers.
Method: Self-administered questionnaire was given to 224 participants (including 98 HCWs and 126 students) in Mbarara Hospital, Uganda. Data were analysed with descriptive statistics using the Statistical Package for the Social Sciences version 15.0 (SPSS Inc, Chicago, IL, USA).
Findings: Of the 224 participants surveyed, 19.2% reported having sustained injection needle stick injuries in the previous year, of which 4.46% occurred with HIV-infected blood. Other reported injuries were cannula needle stick injury (0.89%), suture needle stick injuries (3.13%), scalpel cut injuries (0.45%) and muco-cutaneous contamination (10.27%). The most affected groups were nurses–midwives for scalpel injuries and students for stick injuries. The predisposing factors reported included lack of protective devices and recapping of needles. Exposures were under-reported. Uptake of PEP was also low.
Conclusion: Occupational exposure to HIV presents a conflict situation for HCWs. It remains a frequent occurrence particularly among student nurses–midwives, despite being avoidable. Its prophylactic treatment is hampered by poor reporting and investigation of exposures, and poor access to PEP. Strict adherence to universal precaution and proper handling of occupational exposure to HIV should be encouraged.

Keywords: Health-Care Workers, HIV, Occupational Exposure, Post-Exposure Prophylaxis, Predisposing Factors, Students, Uganda

Introduction

Occupational exposure to human immunodeficiency virus (HIV) presents a low but potential risk of HIV infection (CDC 2001; Sagoe-Moses et al. 2001). Prospective studies of health-care workers (HCWs) have estimated the risk for HIV infection after an occupational exposure to HIV-infected blood to be 0.3% after percutaneous exposure and 0.09% after mucous membrane exposure and without use of anti-retroviral drugs for post-exposure prophylaxis (PEP) (Bowden et al. 1993; Ippolito et al. 1993; Machado et al. 1992 & Tokars et al. 1993). The risk is considerably higher in cases of deep injury, visible blood on the sharp device, a procedure that involves a needle placed in the patient's artery or vein, and a patient with advanced acquired immune deficiency syndrome (AIDS) (Cardo et al. 1995).

The World Health Organization estimates that 3 million percutaneous exposures occur annually among 35 million HCWs globally, corresponding to 1000 new HIV infections from occupational exposure with over 90% occurring in resource-constrained countries (Pruss-Ustun et al. 2005). This risk is

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probably highest in sub-Saharan Africa and Asia where incidence rates as high as nine exposures/health worker/year were reported (Gumodoka et al. 1997; Gupta et al. 2008).

The risk factors for occupational exposure to HIV among health workers are well documented and consistent across literature from Africa, Asia, Europe and America. They include being a trainee like intern/registrar doctor, a nurse–midwife and a surgeon; places like medical wards, intensive care units and operating theatres; and medical procedures like emergency surgery and Caesarean sections (Adegboye et al. 1994; Consten et al. 1995; Evans et al. 2001; Gumodoka et al. 1997; Gupta et al. 2008; Syed et al. 2006; Tarantola et al. 2005). Literature is, however, scarce about the circumstances that predispose to occupational exposure to HIV, particularly those from the affected health worker's perspectives.

The literature available indicates the unnecessary use of needles, lack of safer needle holders and sharps disposal containers, continued recapping of needles after use, lack of training for health workers, long working hours of >40 h/week, failure to use gloves when handling needles and the belief among health workers that the risk of HIV seroconversion from occupational exposure is low as the most important predisposing factors to needle stick injuries (Doebbeling et al. 2003; Nsubuga & Jaakkola 2005; Pruss-Ustun et al. 2003; Smyser et al. 1990). More so, a study conducted in Tanzania, East Africa, revealed insufficient measures to reduce the risk of HIV transmission, e.g. non-functional water taps, lack of plastic bags for disposal of medical wastes and shortage of gloves (Gumodoka et al. 1997). In Ethiopia, Reda et al. (2009) revealed the non-protective effect of work inexperience on occurrence of needle stick injuries. However, none of the above studies examined the relationship between each of the above factors and the occurrence of occupational exposure to HIV in a cross-sectional survey design. Other factors clearly missing in the literature are the role of health worker's level of training and concern about their personal safety during patient care on the use of safety devices and the occurrence of occupational exposure to HIV.

PEP with anti-retroviral drugs can reduce the risk of HIV seroconversion following occupational exposure to HIV. Cardo et al. (1995) demonstrated that anti-retroviral drugs can reduce by approximately 81% the risk for HIV infection after an occupational exposure.

Despite the effectiveness of PEP, reporting of exposure, uptake and adherence to PEP can be very poor (Chen et al. 2001; Evans et al. 2001; Hamlyn & Easterbrook 2007; Lin et al. 2008; Ooi et al. 2004). The indifferent attitude of hospital management towards reported exposures, lack of knowledge about PEP guidelines and side effects were some of the reasons for poor reporting of occupational exposures and for poor uptake and non-adherence to PEP. Lack of knowledge about PEP on the part of the HCW may translate to missed opportunities for PEP and may lead to an increased risk of HIV seroconversion following occupational exposure to HIV. Despite our setting having a high HIV prevalence, information was lacking regarding the factors influencing reporting of occupational exposures to HIV, and uptake and adherence to PEP among health workers.

In view of the aforementioned problems, the aim of this study was to determine the frequency of occupational exposure to HIV among Ugandan HCWs, the circumstances under which exposures occur, the predisposing factors, the risk groups, the extent to which occupational exposures to HIV are reported and PEP services utilized. The findings will be crucial for planning policies and educational sessions on prevention and management of exposures, hence preventing HIV infection.

Methodology

Study setting

The study was conducted in Mbarara Regional Referral Hospital (MRRH) situated in south-western Uganda. The hospital has a high population of patients with the HIV infection, the prevalence being 25% (Wanyenze et al. 2008). The highest prevalence was found in medical inpatients (35%), and the lowest was found in surgical inpatients (12%) (Wanyenze et al. 2008). The hospital is a referral centre for over six districts in south-western Uganda. It also serves as a teaching hospital for Mbarara University of Science and Technology (MUST).

Our study setting is implementing both the voluntary and routine HIV counselling and testing policies, through which all the departments/clinics of the hospital approach patients/clients in their departments with HIV counselling and testing services irrespective of the patient's reasons for visiting the hospital. Therefore, information about HIV sero-status of patients can easily be ascertained. More so, there is an AIDS treatment clinic that provides anti-retroviral drugs including PEP. Despite the availability of the aforementioned services, information is lacking on the extent to which PEP services are utilized by HCWs at times of occupational exposure to HIV.

Research design

This was a cross-sectional study in which data were collected at one point in time, and participants were recruited regardless of exposure or HIV sero-status.

Study population

The study populations were HCWs and students. HCWs included doctors, nurses, midwives and medical laboratory technicians. Students were medical and nursing students.

Sample size

The sample size was 384 participants. Power calculation was used to determine the sample size at 0.05 significance level.

Selection criteria and sampling

HCWs were included in the study if they were a qualified doctor, nurses–midwives, medical laboratory technicians and other health professionals working in MRRH. Only students in clinical practice were included. Stratified systematic sampling was used to select the participants. The study population was first divided into two strata, namely, HCWs and students. The lists of names of the students and HCWs were established. These formed the sampling frames. From the lists, every second participant was selected until the required sample was reached. The selected participants were approached and requested to complete the questionnaire.

Data collection instrument and method

Data collection occurred between January 2008 and March 2008. Self-administered questionnaire was the instrument for data collection. The questionnaire was designed to capture information on whether participants ever experienced needle stick injury and cuts, or were soiled with blood of patients in the previous year; the HIV sero-status of the patient; the number of times exposure occurred; the setting and circumstances under which the accident occurred; the immediate first aid actions taken; access and use of PEP; and challenges encountered. Other items in the questionnaire captured data about universal precaution; medical waste-related knowledge, attitudes and practices; perceived risk of HIV infection from occupational exposures; and whether they have ever received education in prevention and management of occupational HIV exposure. Basic demographical data including age, sex, qualification and years of experience were also collected.

The questionnaires were handed to the selected HCWs at their workplaces, and completed questionnaires were returned within a 1-month period. Several follow-up visits to participants were arranged to ensure questionnaires were returned.

The questionnaire was designed for this study using the literature by the research team. It was pre-tested, and appropriate adjustments were made to ensure content and face validity.

Data analysis

Data were analysed using the Statistical Package for Social Scientists version 15.0. Descriptive statistics was used to determine frequencies and percentages of occupational exposure to HIV through the various means. The predisposing factors were identified from the participants' self-reports of the reasons why and the circumstances under which the injuries or contamination with patient's blood occurred. Responses were compared using chi-square statistics for categorical data. The 95% confidence interval, 0.05 significance level, power 80% and two-tailed tests were used for all the statistical tests. Tables were used to present the results.

Ethical considerations

Ethical approval was obtained from the Faculty of Medicine Research Review and Ethics Committee of MUST in Uganda before commencement of the research. The clearance included the consent of the hospital to publish its name. Written informed consent was obtained from each participant before data collection.

Findings

The participants

Of the 384 questionnaires issued, 224 were returned, giving a response rate of 58.3%. The main reason for non-response was loss to follow-up. Repeated contacts were made to ensure that all questionnaires were returned. Table S1 shows the demographical characteristics of the participants.

Participant's age range was 21–64 years; mean age was 32.33 years [standard deviation (SD) = 10.54], and median age was 28 years. Over half ($n = 126$, 56.3%) of the participants were students. The clinical experience of the participants ranged from 1 to 41 years (mean = 8.42, SD = 8.75). The median number of years of clinical experience was 4 years. Sixty-three (28.1%) of the participants reported no training on prevention of occupational exposure to HIV, PEP or universal precautions. More students than qualified HCWs reported having received training about universal precautions [$\chi^2 = 11.820$; degrees of freedom (d.f.) = 1; $P = 0.001$].

Prevalence of occupational exposure to HIV

The findings regarding the prevalence, predisposing factors, reporting rate and PEP use by category of occupational exposure are shown in Table 1. Overall, of the 224 HCWs surveyed, 20 (8.93%) were exposed to HIV through percutaneous injuries, while 23 (10.27%) were exposed through muco-cutaneous contamination.

Risk groups to occupational exposure to HIV

The age group of 21–35 years was the most vulnerable group for occupational exposure to HIV. Exposure through contamination was significantly higher among the 21–35 years age group compared with older age groups (69.2% vs. 31.8%, $\chi^2 = 9.116$, d.f. = 2, $P = 0.010$). For other routes of exposure, no significant differences were observed between the age group of 21–35 years and older groups.

Exposure through scalpel injuries was significantly higher in nurses–midwives compared with other health professionals (66.7% vs. 33.3%, $\chi^2 = 28.326$, d.f. = 6, $P = 0.001$). For other routes of exposures, no significant differences were observed between nurses–midwives and other health professionals.

Table 1 Prevalence, predisposing factors, reporting rate and PEP use by category of occupational exposure to HIV ($n = 224$)

	Categories of occupational exposure to patient's blood				
	INSI	*CNSI*	*SNSI*	*SCI*	*MCC*
Prevalence data ($n = 224$)					
Participants ever exposed to patient's blood in previous year (n)	43	19	26	7	130
Participants exposed to the blood of a known HIV+ patient (f)	10	2	7	1	23
Prevalence of occupational exposure to HIV (f/n × 100%)	4.46%	0.89%	3.23%	0.45%	10.27%
Predisposing factors to exposure reported by participants in % ($n = 224$)					
Poor clinical skills/inexperience	71 (31.7)	28 (12.5)	47 (20.8)	0	0
Inadequate restraint of paediatric patients during procedures	38 (17.1)	42 (18.8)	0	0	0
Inadequate reassurance of patients before procedures	38 (17.1)	28 (12.5)	10 (4.2)	32 (14.3)	0
Recapping of needles	27 (12.1)	14 (6.3)	0	0	0
Being less careful during procedures	22 (9.8)	14 (6.3)	10 (4.2)	96 (42.9)	131 (58.6)
Anxiety/panicking during procedures	11 (4.9)	28 (12.5)	0	0	0
Improper disposal of sharps	5 (2.4)	42 (18.8)	0	0	0
Use of unskilled assistant during procedures	5 (2.4)	0	0	32 (14.3)	0
Poor visibility	5 (2.4)	0	0	0	0
Physical disturbance during procedure	0	14 (6.3)	0	0	0
Fatigue/tiredness	0	14 (6.3)	10 (4.2)	0	0
Inadequate anaesthesia of the patient before painful procedure	0	0	103 (45.8)	32 (14.3)	0
Lack of instruments, e.g. needle holders and forceps	0	0	28 (12.5)	32 (14.3)	46 (20.6)
Damaged or delicate gloves that broke during procedures	0	0	28 (12.5)	0	47 (20.8)
Exposure reporting and PEP use in % ($n = 104$)					
Exposures reported	48 (46.5)	38 (36.8)	28 (26.9)	104 (100)	24 (22.5)
PEP was initiated	5 (4.7)	30 (28.6)	12 (11.5)	0	02 (1.5)
PEP was completed in schedule	5 (4.7)	30 (28.6)	12 (11.5)	0	02 (1.5)

CNSI, cannula needle stick injury; HIV, human immunodeficiency virus; INSI, injection needle stick injury; MCC, muco-cutaneous contamination; PEP, post-exposure prophylaxis; SCI, scalpel cut injuries; SNSI, suture needle stick injury.

Similarly, a significantly higher rate of scalpel injuries was reported among students compared with qualified HCWs (66.7% vs. 33.3%, $\chi^2 = 33.164$, d.f. = 16, $P = 0.007$). For needle stick injuries and mucous membrane contamination, no significant differences were however observed between students and qualified HCWs.

Low clinical experience was found to be an important risk factor for occupational exposure to HIV. For example, significantly higher exposures through contamination were reported among participants with clinical experience of less than 15 years compared with those with experience of more than 15 years (90% vs. 10%, $\chi^2 = 13.92$, d.f. = 2, $P = 0.001$). For exposures through sharp injuries, no significant differences were observed between highly experienced and less experienced participants.

Surgical units such as emergency ward, surgical theatre and surgical ward were found to carry an increased risk for exposure compared with other units. For example, exposure through muco-cutaneous contamination was found to be significantly higher among participants working in surgical units compared with other units (21.5% vs. 78.5%, $\chi^2 = 28.498$, d.f. = 8, $P < 0.001$). For exposures through injection, suture and cannula needle stick injuries, no significant differences were observed between participants working in surgical units and other units.

Participants who perceived a low risk of HIV seroconversion from occupational exposures were found to be another high-risk group. For example, exposures through needle stick injuries were found to be significantly higher among participants who perceived a low risk of contracting HIV from needle stick injuries compared with those who perceived a higher risk of contracting HIV from needle stick injuries (70.4% vs. 29.6%, $\chi^2 = 12.612$, d.f. = 3, $P = 0.006$).

As for the role of universal precautions, no significant differences were observed between participants who always and rarely used universal precautions regarding occupational exposure to HIV through the various routes. Similarly, we found no significant difference between participants with low and high personal concern for safety with respect to occupational exposure to HIV through the various routes. We also found no significant difference between participants who felt that safety devices were inadequate in their workplace and those who felt that safety devices were adequate with respect to occupational exposures to HIV through the various means.

Table 2 Distribution of occupational exposure to HIV by the setting and clinical procedures

	Categories of occupational exposure to patient's blood				
	INSI (n = 43) n (%)	*CNSI (n = 19)*	*SNSI (n = 26)*	*SCI (n = 7)*	*MCC (n = 126)*
Settings					
Medical ward	14 (32.6)	8 (42.1)	0	0	15 (11.7)
Surgical ward	3 (7.0)	4 (21.1)	8 (30.8)	2 (28.6)	18 (14.1)
Paediatric ward	10 (23.3)	3 (15.8)	0	1 (14.3)	0
Emergency ward	2 (4.6)	2 (10.5)	0	0	9 (7.0)
Obstetrics and gynaecology wards	8 (18.6)	2 (10.5)	14 (53.8)	1 (14.3)	60 (47.7)
Outpatient clinics	3 (6.9)	0	0	0	3 (2.3)
Emergency laboratory	2 (4.7)	0	0	0	3 (2.3)
Operation theatre	0	0	4 (15.4)	0	6 (4.7)
Post-mortem room	0	0	0	1 (14.3)	0
Plaster room	0	0	0	1 (14.3)	0
Circumstances/procedures					
Injection (IM/IV)	17 (39.5)	0	0	0	1 (0.8)
Phlebotomy	14 (32.6)	2 (10.5)	0	0	9 (7.1)
Cannulation	5 (11.6)	14 (73.7)	0	1 (14.3)	16 (12.7)
Making blood slide	2 (4.7)	0	0	0	1 (0.8)
Episiotomy repair	2 (4.7)	0	10 (38.5)	0	4 (3.2)
Post-mortem	1 (2.3)	0	0	1 (14.3)	1 (0.8)
Drawing drug from vial	1 (2.3)	0	0	0	0
Assisting in surgery	1 (2.3)	0	4 (15.4)	0	8 (6.3)
Disposing cannula	0	2 (10.5)	0	0	1 (0.8)
Ascitic tap	0	1 (5.31)	0	0	0
Wound debridement	0	0	10 (38.5)	2 (28.6)	5 (4.0)
Stitching perineal tear	0	0	1 (3.8)	0	0
Conducting surgery	0	0	10 (38)	1 (14.3)	6 (4.8)
Cutting plaster of Paris	0	0	0	1 (14.3)	0
Delivering baby	0	0	0	0	43 (34.1)
Wound dressing	0	0	0	0	4 (3.2)
Others	0	0	0	0	27 (21.4)

CNSI, cannula needle stick injury; HIV, human immunodeficiency virus; IM, intra-muscular; INSI, injection needle stick injury; IV, intra-venous; MCC, muco-cutaneous contamination; SCI, scalpel cut injury; SNSI, suture needle stick injury.

Setting and circumstances under which occupational exposure to HIV occurs

The findings regarding the setting and circumstances under which exposure to HIV occurred among the participants is shown in Table 2. The other 48 (21.4%) of the participants were exposed to HIV while arresting haemorrhage, reducing fractures, grouping and crossmatching blood, physically examining patients, performing bed baths, drawing random blood sugars, transporting blood samples, cleaning specimen bottles, estimating haemoglobins, extracting teeth, irrigating bladders, packing the nose, serving linens, passing nasogastric tubes, removing foreign bodies from the eyes, excising biopsy and resuscitating patients.

Barriers to PEP

One hundred and four ($n = 104$) participants provided data regarded as the barriers to reporting exposures. Forty-nine (47.1%) of the participants did not report exposure because they believed that the risk of HIV infection from occupational exposure is low. Another 28 (26.9%) of the participants did not report exposure because they believed that the first aid treatment (washing the exposed area with plenty of running water and soap) was adequate to prevent HIV seroconversion. Another eight (7.7%) of the participants held the assumption that the patient was HIV negative so they did not report the exposure. Similarly, seven (6.9%) of the participants did not report exposure because they felt that the injury and exposure were very minor. Lastly, three (2.9%) participants did not report exposure because of fear of the long and tiresome process of reporting exposure.

Data regarding barriers to initiating PEP were provided by 14 participants. Three (21.4%) of the participants did not initiate PEP because the physician responsible could not be reached to prescribe anti-retroviral drugs within 24 h of exposure. Two (14.3%) of the participants did not initiate PEP after exposure because of fear of side effects of anti-retroviral drugs.

Discussion

Occupational exposure to HIV through percutaneous injuries and mucous membrane contamination was found to be prevalent among HCWs. Comparing our estimates for prevalence of exposure to HIV among HCWs with those in the literature is difficult because of differences in measurement methods. Nonetheless, our estimates are more on the lower side because the HIV sero-status of some of the patients with whom exposures occurred was not established.

Our findings that nurses–midwives were at higher risk of sustaining occupational exposure to HIV through percutaneous injuries and muco-cutaneous contamination compared with other HCW are not unique. Evans et al. (2001) also found that nurses–midwives were at higher risk of occupational exposure than doctors. The increased risk of occupational exposure to HIV among nurses–midwives can be explained by circumstances/procedures during which exposures occurred. Procedures such as injection, venipuncture, repair of episiotomy after childbirth and stitching, during which exposure occurred, are performed mainly by nurses–midwives in their daily work. This implies that occupational exposures to HIV directly conflict with the core responsibilities of nurses–midwives and therefore seriously affect the profession. The challenge presented by HIV to nurses–midwives calls for routine and mandatory counselling and testing for HIV sero-status of patients so that HCWs take extra precaution when caring for HIV-infected patients. It also calls for the provision of adequate protective devices, encouragement and support of nurses–midwives.

Remarkably, our finding that nurses–midwives had the greatest exposure to scalpel injuries of all health professionals is not supported in the Western nursing literature. This is an issue that needs further attention and continuous research.

Our research indicates that more students than qualified HCWs received occupational exposure to HIV. This is not unique to our study either. Gilks and Wilkinson (1998) similarly found a higher frequency of risky needle stick injuries and other exposures to body fluids among the less experienced practitioners like students and interns, especially more so from the surgical disciplines. It is obvious that the clinical skills of students are still developing. Notably, the approach of health professional education in our study setting makes less use of anatomical models and skill laboratories, probably because of cost issues and poor staffing. Exercises on models in skill laboratory provide opportunity for students to gain confidence and acquire good skills, an attribute that would decrease risk of exposure. Similarly, the common practice of using health professional students to alleviate health workforce shortage in our study setting also needs reconsideration. If students are given tasks to be performed, they have to be adequately supervised. However, the feasibility of ensuring that students are adequately supervised remains questionable in the face of the HCW shortage crisis in many hospitals in Uganda. These kinds of dilemmas present stumbling blocks in the prevention of occupational exposure to HIV among HCWs in developing nations. Strict adherence to universal precautions and protocols for handling occupational exposure to HIV (presented under the Conclusion section of this paper) is recommended.

The finding that 28.1% ($n = 63$) of the participants received no training on prevention of occupational exposure nor PEP nor universal precautions is one of the most important findings of this study, and one that is most easily fixable. The principles and methods of prevention of occupational exposures, PEP and universal precautions are usually taught in the clinical settings, for example, during certain medical or nursing procedures such as venipuncture. It is rare to find special lessons organized on issues to do with occupational exposure to HIV and other blood-borne pathogens. The chances of receiving trainings on the above issues therefore were dependent on the clinical experience of the participants. This implies that the lack of training among some participants is not unique to this hospital nor the study as the same situation was observed in other university teaching hospitals in developing nations (Gupta et al. 2008). Tailored continued nursing education sessions or refresher clinical skills courses for HCWs and students are therefore recommended.

Reporting of exposures was found to be very low among HCWs in this study. Without reporting of exposure, PEP can not be initiated. Notable were the findings that hospital administration has failed to provide 24 h, 7 days per week availability of a physician, perhaps at least one on call, who can counsel personnel who sustained these exposures and prescribe anti-retroviral drugs, and the lack of awareness about PEP guidelines among HCWs. The same situation was also observed in China (Lin et al. 2008). Unfortunately, it was beyond the scope of this study to establish why the hospital administration has failed to avail a physician who can counsel and prescribe anti-retroviral drugs to personnel who sustained occupational exposure to HIV.

Unique to our study are some of the circumstances under which occupational exposure to HIV occurred. Issues such as inadequate restraint of patients, inadequate reassurance of patients, inadequate analgesia of patients, inadequate local anaesthesia of patients, use of unskilled assistants during procedures and carelessness on the part of HCWs were not previously reported in the literature. The above factors imply that HCWs overlooked or underrated the pain experience of patients during some invasive procedures, so much so that they do not take adequate pain management. Invasive procedures such as intramuscular injections, phlebotomy, episiotomy repair after childbirth and cannulation for intravenous therapy are so common in the daily tasks of HCWs in our setting that they are seen as routine work. The patient's pain experience is underrated so much so that they are often performed without local anaesthesia, analgesia, restraint or reassurance. Also, analgesic and anesthetic drugs are not always available when needed for invasive procedures. The above finding is evidence that HCWs are risking HIV infection if they omit basic steps before any invasive procedure such as counselling and reassurance.

Our finding that the use of unskilled assistants such as relatives or friends of patients, commonly termed 'patient attendants', to assist during clinical procedures sometimes predisposes HCWs to the occurrence of percutaneous injuries or mucous membrane contamination, and warrants some attention. This finding is also unique to our research. The use of patient attendants to provide assistance during clinical procedures is a common practice in hospitals in Uganda. They take responsibility for all of the basic nursing tasks such as bathing, feeding, toileting, mobilization and protection from fall of the patient. The professional nurses–midwives, however, provide them guidance and support whenever necessary. They are sometimes called upon to assist the professional nurse–midwife during technical procedures such as injections. Whereas the task shifting approach provides a reliable solution to the problem of health workforce shortage, our finding now provides evidence that it is risky to use patient attendants because they are not trained and they mesh a lot while assisting with certain technical procedures. Therefore, whether to use or not to use the services of patient attendants remains an internal conflict situation for HCWs in our setting.

Optimal post-exposure care, including anti-retroviral therapy to prevent HIV seroconversion, remains a high priority for protecting HCWs (Gerberding, 2003). Therefore, it is recommended that PEP should be initiated as soon as possible following the exposure and at the latest within 72 h post-exposure. If antiretroviral drugs can be initiated within 72 h, then it would not be necessary to have a physician present around-the-clock to administer it. However, access to PEP after exposure was found to be a challenge to HCWs in our study. The same challenge was documented by Lin et al. (2008). Some victims of exposure sought PEP immediately after exposure but were disappointed especially at night and during weekends. This occurs because there is no organized system within the hospital for reporting, investigating and treating exposures. These findings are justification for initiating a special programme for long-term follow-up of HCWs who report occupational exposure to HIV as a strategy for HIV infection control.

Lack of access to PEP at nights and on weekends is a key finding that warrants some attention. HCWs, particularly nurses–midwives and intern doctors, are often put on night and weekend duties to ensure continued care and treatment for inpatients. Our study revealed that the consultant physician responsible for PEP is usually off duty at nights and on weekends. This denies chances of receiving PEP when exposure occurs at night or over the weekend. This is a fixable problem if there was an organized department with staff assigned to receive, follow-up and treat reported exposures in the hospital.

Research limitations

Some of the participants were students that affect the policy implication of some of the study findings because they are still under training and will develop good clinical skills over the course of their studies. Using recall as a method for determining exposure is subject to recall bias. Furthermore, exposures to HIV through other body fluids such as urine, saliva, liquor, ascitic fluid, sputum and pus were not established, hence the likelihood that the overall exposure was underestimated, although these fluids do not transmit HIV unless they contain blood. No information is obtained about the HIV sero-status of the health workers before and after the occupational exposure.

Conclusion

Occupational exposure to HIV presents a conflict situation for HCWs. It remains a frequent occurrence, particularly among nurses–midwives, despite being preventable. Its treatment is hampered by poor reporting and investigation of exposures, and poor access to PEP. HCWs are torn between their responsibilities of providing health-care services for all patients irrespective of their HIV sero-status and also protecting themselves from occupational exposure to HIV in a low-resource setting.

We recommend the following protocol for handling occupational exposures to HIV.

Definition of occupational exposure to HIV

An occupational exposure that may place a HCW at risk of HIV infection is defined as a percutaneous injury (e.g. a needle stick or cut with a sharp object), contact of mucous membranes or contact of skin (especially when the exposed skin is chapped, abraded or afflicted with dermatitis or when the contact is prolonged or involves an extensive area) with blood, tissues or other potentially infectious body fluids (i.e. those to which universal precautions apply). These fluids include: (a) semen, vaginal secretions, breast milk or any other body fluid visibly contaminated with blood, because these substances have been implicated in the transmission of HIV infection; (b) cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid and amniotic fluid, because the risk of transmission of HIV from these fluids has not yet been determined; and (c) laboratory specimens that contain HIV (e.g. suspensions of concentrated virus, unfixed tissues or organs, organ cultures and blood, organs or other tissues from experimental animals infected with HIV).

For purposes of this protocol, the occupational exposure must be to a fluid known to be infected with HIV [e.g. positive for:

antibodies to HIV, HIV p24 antigen, HIVDNA by polymerase chain reaction or other molecular biological technique (e.g. in situ hybridization), or HIV culture]. Persons known or suspected to be HIV positive include patients meeting the AIDS definition or known to be infected with HIV, or patients with epidemiological evidence suggesting that the source individual may have recently been exposed to HIV. In situations where the source fluid is of unknown HIV infection status and identifying information is lacking, it should be promptly tested for HIV antibodies by the serology section. If the occupational exposure occurs while performing a medical procedure (i.e. venipuncture), then the source individual should be asked to consent to HIV antibody testing, according to local/state laws. If the source individual cannot be identified or is identified but not readily available to provide informed consent, then the fluid should be tested for HIV antibodies after removal of any identifying information.

General principles for handling occupational exposures to HIV

Each incident of occupational exposure to potentially infectious blood or fluids (i.e. those requiring universal precautions) should be treated as a medical emergency because certain interventions that may be appropriate must be initiated promptly to be effective. If a worker sustains an occupational exposure, then first aid should be administered as necessary (including wound cleansing and irrigation with soap and water), and both the exposed worker and the source fluids should be tested for antibodies to hepatitis B virus and HIV to determine the possible need for the exposed worker to receive appropriate prophylaxis.

If the source fluid is known to be infected with HIV or needs to be evaluated for that possibility, the following section provides the protocol that should be followed. Because post-exposure use of zidovudine requires prompt action, employees who handle blood or any specimens requiring universal precautions should be familiar with this protocol. The post-exposure period is not the optimal time to first consider the use of zidovudine.

To expedite the appropriate procedures following an occupational exposure to HIV, HCWs and their supervisors should be familiar with the actions outlined in this document for exposures during duty hours and non-duty hours. Ideally, the HCW should immediately notify the supervisor (or someone who can act on behalf of the supervisor), who should accompany the HCW to the clinic as quickly as possible. The HCW should move expeditiously to the clinic, even if there is no one to accompany him/her.

It is important that affected HCWs experiencing the stress of injury and possible exposure to HIV-containing materials should be accompanied by their supervisor or other co-worker. Such a person may provide psychological support, serve as the affected HCW's 'advocate' to assure prompt attention or otherwise provide assistance.

Specific protocol for handling occupational exposures to HIV

1 The affected HCW should immediately clean exposed surfaces (by washing the skin with soap and water, or irrigating the mucous membranes with sterile normal saline or water), apply first aid to local wound as needed and report exposure (1) to his/her supervisor. This incident is to be treated as a medical emergency.

2 The affected HCW and supervisor should go to occupational health clinic (OHC) or HIV/AIDS clinic, if available, for immediate medical evaluation and to complete an incident form. If the supervisor or designated safety liaison is not immediately available, the affected HCW should report to the OHC or the HIV/AIDS clinic. The OHC or HIV/AIDS clinic director should be informed that the supervisor was not available and should continue to attempt to contact the supervisor. The OHC or HIV/AIDS clinic director should provide additional medical treatment to the wound, as necessary, and make an initial assessment of risk. The OHC or HIV/AIDS clinic director should also counsel the affected HCW on the risk of HIV infection, discuss the option of taking zidovudine and draw a baseline blood sample. If the employee chooses to take zidovudine, then the OHC or HIV/AIDS clinic director should promptly provide him/her with the drug and have the employee sign the informed consent form. At his/her discretion, the OHC or HIV/AIDS clinic director may contact a designated physician (2) for consultation. Regardless of the affected HCW's decision to take zidovudine, the OHC or HIV/AIDS clinic medical director should initiate a referral to physician (3) for appropriate follow-up.

3 The supervisor should take a copy of the bottom portion of the incident form, which does not contain personal identifiers, and route it through appropriate channels to the hospital executive director or acting director.

4 The hospital executive director or acting director then notifies the hospital administration of the incident for follow-up investigation.

If HCWs, supervisors and students abide by the aforementioned protocol for handling occupational exposure to HIV and adhere to the use of universal precautions, HIV transmission from occupational exposure will be minimized.

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Author contributions

Edward Kumakech was the principal investigator. Susan Achora was co-investigator. Vanja Berggren provided technical assistance in research design and review of manuscript. Francis Bajunirwe provided technical assistance in statistical data analysis.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1 Distribution of participants by demographical characteristics

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