

Needle-stick injuries in an Ugandan teaching hospital

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The on-going HIV epidemic has generally increased fear of needle-stick injuries (NSI) and renewed interest in the problem such injuries pose in Africa. The aims of the present study were to evaluate the frequency of NSI, explore the circumstances surrounding each injury and estimate the corresponding infection risk, among healthcare workers (HCW) in Uganda. Questionnaires, asking the recipients how many NSI they had suffered in the past year, how each of these NSI had occurred, what (perceived) risk of infection was associated with each injury, and what their practical and psychological reactions were, were sent to the HCW associated with the Mbarara Teaching Hospital in Uganda. Of the 280 individuals who received questionnaires, 180 (64%) responded and 100 (55% of the respondents) each reported suffering at least one NSI in the previous year. The total number of NSI reported (336) represented an incidence of 1.86 NSI/HCW-year. Interns suffered more NSI (annual mean = 4.8) than any other occupational group. Most NSI occurred when patients moved during procedures, when HCW re-sheathed needles, or during suturing (each reported by 55 HCW — 30% of those responding). Following NSI, 60 HCW said they squeezed the site of the injury and washed it with bleach, 43 believed they had a 10% risk of HIV infection, 87 felt anxious, 54 felt depressed, 40 prayed, 24 had an HIV test, and four were counselled. To estimate actual infection risk, 435 patients were screened for antibody to HIV (1 and 2) and for the surface antigen of the hepatitis B virus (HBSAg); 26% and 2.8% were found seropositive, respectively. These seroprevalences were multiplied by previously determined probabilities of transmission to give estimated risks of infection (following a single NSI) of 0.08% for HIV and 0.135% for hepatitis B. During 3 years of training as a clinician (i.e. 2 years as a medical student and 1 year as an intern), more than six in 1000 individuals would be infected with HIV as a result of NSI and almost 10 in 1000 would be infected with hepatitis B virus by the same route. NSI are common, preventable sources of infection and stress for HCW in Africa.

Needle-stick injuries (NSI) remain a source of infection for healthcare workers (HCW) world-wide (Marcus *et al.*, 1989; Ippolito *et al.*, 1993). Following NSI with infected blood, transmission of HIV and hepatitis B virus (HBV) occurs in 0.1%–0.49% and 5% of cases, respectively (Gill and Porter, 1989; Ippolito *et al.*, 1993; Anon., 1997). Although the risk of infection following a single NSI is extremely small, ‘universal precautions’ and immunization against hepatitis B may reduce

the risk of injury, infection and illness (Anon., 1988). The administration of ‘prophylactic’ anti-retroviral drugs (ARV) immediately after an NSI may reduce the effects of any HIV transmission but such drugs remain largely unaffordable in Africa, where more than 23 million HIV-infected people live (Veeken *et al.*, 1991; Gilks and Wilkinson, 1998; Anon., 1999). The large numbers of HIV-infected individuals have increased the anxiety surrounding NSI in Africa. The aims of the present study were to estimate the frequency of NSI, describe the circumstances surrounding them, and estimate the associated risk of HIV and HBV infection, in an Ugandan teaching hospital.

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SUBJECTS AND METHODS

Mbarara University Teaching Hospital (MUTH) is the referral centre for south-western Uganda and home to Uganda's second medical school. In November 1999, a voluntary, anonymous questionnaire was circulated to each of 280 HCW associated with the hospital. The questionnaire explored each respondent's knowledge and experience of NSI. If the subject was illiterate the questionnaire was administered through an interview.

Frequency of NSI and Circumstances Surrounding NSI

The HCW were asked to record the number of NSI they remembered sustaining during the previous year, how these had occurred (e.g. re-sheathing needles, suturing, patients moving etc), which infections they believed could have been transmitted (none, HIV, HBV, malaria, bacteria causing bacterial sepsis etc), and their perception of the risk of infection with HIV (10%, 1%, 0.3%, zero etc). They were also asked to record how they had reacted, on both a practical level (e.g. squeezing the site, washing with bleach, counselling and HIV testing) and a psychological level (e.g. anxiety, depression, prayers etc) to their NSI.

Estimates of Infection Risk

To evaluate the local seroprevalences of HIV and HBV, sera were salvaged following routine tests from 435 anonymous patients at the MUTH, and analysed for antibody to HIV (1 and 2) and the surface antigen of HBV (HBsAg) using commercial ELISA (Murex Diagnostics, Dartford, U.K.). Seroprevalences were estimated separately for patients in the medical, surgical, maternity, paediatric and outpatient departments. The risks of infection (%) from a single NSI in each department of the hospital (assuming each NSI occurred after the needle had been used) were then estimated by multiplying the HIV and HBV seroprevalences (%) by

0.0033 and 0.05, respectively [assuming that, following NSI with infected blood, transmission of HIV and HBV occurs in 0.33% and 5% of cases, respectively (Gill and Porter, 1989; Ippolito *et al.*, 1993; Anon., 1997)]. The cumulative risk of HIV or HBV infection (as a result of NSI by the end of his or her internship) was calculated for a doctor by adding the corresponding risk over 2 years as a clinical medical student to that experienced over 1 year as an intern. All the data were analysed using version 6 of the Epi Info software package (Centers for Disease Control and Prevention, Atlanta, GA).

RESULTS

Of the 280 HCW, 180 (64%) returned questionnaires. The respondents were lecturers (eight), medical officers (12), interns (nine), laboratory technologists (16), nursing sisters (19), enrolled nurses and aides (49), medical students (52), anaesthetic assistants (three), radiographers (two), cleaners (seven), a dental technician, and two individuals who failed to record their occupations.

Frequency of NSI

One hundred (55%) of the respondents reported that they had suffered at least one NSI each in the previous year. The total number of NSI reported (336) represents a mean of 1.86 NSI/HCW-year. Interns suffered NSI most frequently (4.8 times/year), followed by enrolled nurses and aides (3.1/year), nursing sisters (2.0/year) and medical students (1.3/year). Fifteen respondents (eight enrolled nurses and aides, two interns, two nursing sisters, one medical student, one anaesthetic assistant and a cleaner) had each suffered at least 10 NSI in the previous year (Fig.).

Circumstances Surrounding the NSI

Most (61%) of the 180 respondents admitted taking blood without gloves. NSI had commonly occurred whilst patients moved during

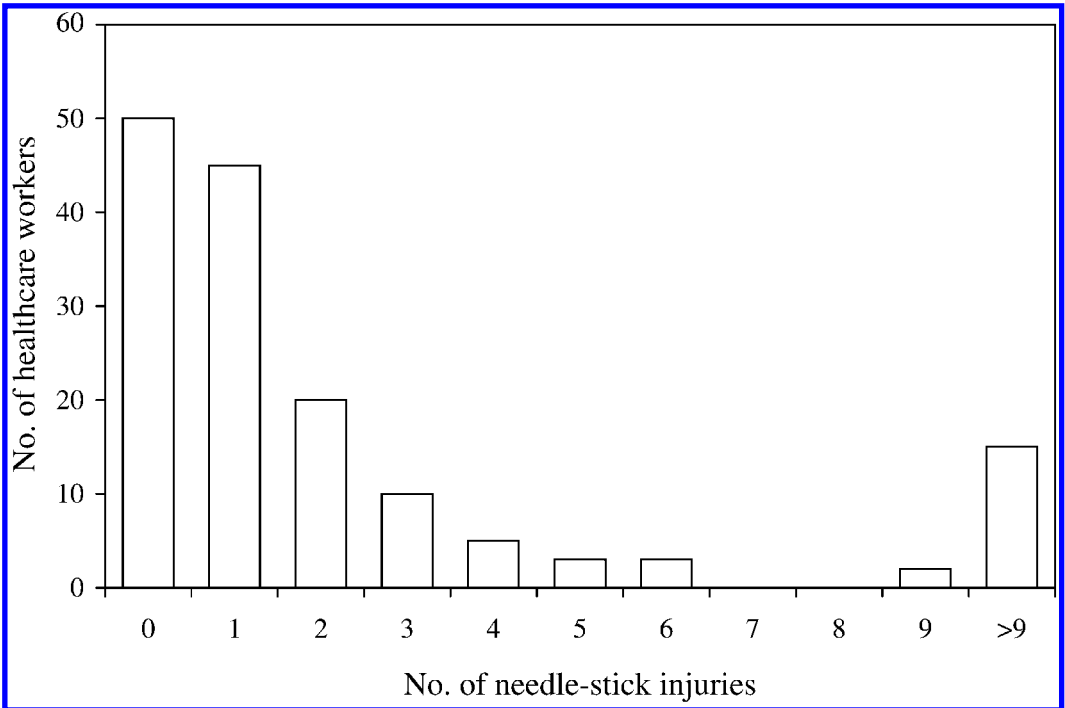


FIG. The annual numbers of needle-stick injuries suffered, remembered and reported by healthcare workers in the Mbarara University Teaching Hospital, Mbarara, Uganda.

procedures, when re-sheathing needles or whilst suturing (each reported by 55 or 30% of the respondents). All 180 respondents were aware that infections could be transmitted through NSI, and 135 (75%) knew that HIV and HBV could be transmitted by such injuries. Fifty (28%) thought there was a 1% risk of HIV infection following a single NSI and 43 (24%) a 10% risk. Following NSI, 60 (33%) of the respondents squeezed the puncture site and then washed the site with bleach. Many experienced anxiety (88, or 49%) or depression (60, or 33%) and 40 (22%) prayed. A minority (24, or 13%) obtained a voluntary HIV test, and only four (3%) received some form of counselling.

Infection Risk from NSI

The serological data and estimated risks of infection are displayed in the Table. Overall, 114 (26.2%) of the patients tested were

found seropositive for HIV, and 12 (2.7%) provided sera found to contain HBSAg. The risk of infection following a single NSI in the hospital was therefore estimated to be 0.08% for HIV and 0.135% for HBV. The cumulative risk for a doctor by the end of his or her internship was estimated to be 0.63% for HIV and 0.99% for HBV. One student reported developing acute hepatitis B following an NSI but no HCW disclosed their HIV status. Eleven of the patients found to have antibodies to HIV were aged ≤ 18 months.

DISCUSSION

NSI appear to be very frequent amongst HCW in Uganda, as in neighbouring Tanzania (Gumodoka *et al.*, 1997). That the annual incidence of NSI reported in Uganda (1.86 NSI/HCW; present study) is lower

TABLE The seroprevalences of HIV and hepatitis B virus (HBV) among patients from five departments of Mbarara University Teaching Hospital, and the related risks of infection of a healthcare worker suffering a single needle-stick injury in one of the departments

	Department					All
	Outpatients	Paediatrics	Maternity	Surgical	Medical	
NO. AND (%) OF PATIENTS:						
Tested	240	77	63	36	19	
Positive for anti-HIV antibody	76 (32)	16 (22)	6 (10)	7 (19)	9 (47)	
Positive for the surface antigen of HBV	2 (0.9)	2 (3)	3 (4)	2 (6)	3 (16)	
RISK PER NEEDLE-STICK INJURY (%) OF:						
HIV infection	0.16	0.1	0.05	0.1	0.25	
HBV infection	0.5	0.5	0.8	1	2.2	

than that reported for Tanzania (5.0 NSI/HCW; Gumodoka *et al.*, 1997) may simply indicate that the present subjects failed to recall injuries which many considered very minor.

That most of the NSI reported in Uganda occurred when patients moved, needles were re-sheathed or during suturing is of interest. Use of a treatment room where routine procedures can be undertaken safely and, at least for the patient, most comfortably may reduce the problem of NSI caused by patients moving inadvertently. The practice of re-sheathing needles should be discouraged although adequate numbers of disposable 'sharps' bins must be provided to take unshathed needles. The careful supervision of interns in surgical specialities should reduce the incidence of NSI associated with suturing. That more than half of the responding HCW stated that they drew blood without gloves is largely a reflection of the frequent lack of gloves at the MUTH. This underlines the problem of executing 'universal precautions' in resource-poor institutions.

There was a substantial awareness of the infection risks from NSI, even amongst the unskilled staff who completed questionnaires for the present study. This is probably largely the result of a campaign by the Ugandan Ministry of Health, under its AIDS-control programme. The estimated risk of HIV infection associated with a single NSI was lower than that of HBV, even though

HIV seroprevalence amongst the patients investigated was 10 times greater than that of seropositivity for HBSAg. Most of the HCW who completed questionnaires were worried about HIV transmission and greatly over-estimated their risk of HIV infection. The high perceived risk of HIV infection presumably increases post-NSI stress. Few of the respondents received post-NSI counselling and most were unaware of any system of professional support at such a distressing time. The psychological effects of NSI may be reduced through counselling, where the individual is reassured, offered HIV testing and re-educated in 'safe-sharps' techniques. The results of a previous survey of HCW in Africa showed that HIV transmission as the result of NSI was negligible compared with sexually acquired HIV infection (Mann *et al.*, 1986). However, as there has been a steady reduction in the rate of sexually transmitted HIV infection in Uganda over the last few years, the relative importance of NSI in HIV transmission is likely to increase (Anon., 2000). Post-exposure prophylaxis with ARV is not widely available in Uganda, and the efficacy of such drugs in preventing HIV infection in this setting remains unclear. Its efficacy in reducing vertical transmission may make nevirapine suitable for such prophylaxis (Guay *et al.*, 2000). Immunization against hepatitis B is now widely available in most parts of the world and will soon

become part of the expanded programme of immunisation in Uganda.

The present results must be treated with some caution as there were several deficiencies in the study. Firstly, no attempt was made to determine the actual number of new infections related to NSI; to do this a large, prospective study, including pre- and post-exposure sampling from HCW, would be required. Secondly, data describing the depth or size of the injury (e.g. whether a hollow or solid needle was involved) were not collected. This is important information as infectivity is related to the volume of blood transferred via the NSI. Thirdly, there was no record of the number of 'high-risk' procedures each HCW performed. Fourthly, the ages of the adult patients investigated were not routinely recorded, although the distribution of HIV and HBV infection may vary considerably with age (Whittle *et al.*, 1990; Fontanet *et al.*, 1998). Fifthly, the risk of HIV infection as the result of NSI involving paediatric patients was probably over-estimated because some of the children found positive for anti-HIV antibody had probably never carried HIV; placental transfer of maternal HIV antibodies to the baby may persist, in the absence of HIV infection, until 18 months of age (Anon., 1987; Johnson *et al.*, 1989). Finally, although the questionnaire stimulated discussion of NSI, its use in preventing further injuries and relieving the anxiety surrounding them was not properly evaluated.

Future studies should focus on the provision of affordable, effective anti-retroviral combinations for sub-Saharan Africa. The development of local guidelines for the prevention and management of NSI and for post-injury counselling would be helpful. A questionnaire, such as the one used in this study, needs evaluation to see if it could help reduce the numbers of NSI and the psychological stress following such injuries. More resources are needed to reduce the burden of NSI in resource-poor settings and protect all HCW world-wide.

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