Occupational exposure to bloodborne viruses amongst medical practitioners in Bloemfontein, South Africa

De Villiers HC, MBChB, MFamMed
Department of Family Medicine, University of the Free State, Bloemfontein, South Africa
Nel M, BA, BA Honours, MMed Sc
Department of Biostatics, University of the Free State, Bloemfontein, South Africa
Prinsloo EAM, MBChB, MFamMed, M HPE
Department of Family Medicine, University of the Free State, Bloemfontein, South Africa

Correspondence to: Ms M Nel, E-mail: gnbsmn.md@mail.uovs.ac.za

Abstract

Background

The possibility of occupational exposure to bloodborne viruses such as HIV, hepatitis B virus (HBV) and hepatitis C virus (HCV) is an everyday reality for healthcare workers. This study reports on the extent and outcome of doctors' exposure to bloodborne viruses in Bloemfontein.

Methods

A descriptive study was done. Doctors (n=441) actively involved in public and/or private medical practice were requested to anonymously complete a questionnaire regarding occupational exposure to bloodborne viruses (HIV, HBV and HCV).

Results

A response rate of 51.7% was obtained. More than half (54.2%, 95% CI [47.7%; 60.5%]) of the respondents were exposed to bloodborne viruses. Of these cases, 48.3% occurred with HIV-positive patients and 4.3% with known HBV-positive patients. No cases involved positive HCV patients. After the exposure had occurred, 68.9% of the patients were tested for HIV, 10.9% for HBV and only 4.2% for HCV infection. The frequency of serological testing for doctors immediately after exposure was 65.3% for HIV, 21.7% for HBV and 8.2% for HCV. No seroconversion to HIV or HCV was reported, while two seroconversions to HBV were reported. Most of the exposures occurred as a result of needlestick injury (85%), often in the operating theatre during procedures (59.3%). The majority (59.8%) of exposed doctors did not take any prophylactic treatment and those who did, did not always complete the treatment.

Conclusion

The risk of seroconversion to HIV after occupational exposure was as expected, while seroconversion to HBV was less than expected. The lack of adequate follow-up serological testing after occupational exposure is alarming. It is the responsibility of the occupationally exposed doctor to adequately comply with prophylactic measures and undergo serological testing to ensure the least possible risk of contracting infection from a bloodborne virus.

SA Fam Pract 2007;49(3):14

The full version of this article is available at: www.safpj.co.za **Ⓟ This article has been peer reviewed**

Introduction

In the present healthcare working environment, HIV/AIDS is a deadly reality. Healthcare workers are exposed to accidental injuries and occupational exposure to bloodborne viruses such as HIV and hepatitis B and C. The outcome of exposure may have far-reaching consequences – not only for the exposed person, but also for his/her practice, employees and family. As doctors often perform procedures involving sharp objects, this study was undertaken to gain insight into the risk in this specific population group. Bloemfontein was chosen as the study area due to its accessibility to the researcher, as well as being indicative of the general South African population.

According to Moloughney, in all cases of accidental exposure to bloodborne viruses, different factors influence the risk of seroconversion.[1] These factors include the frequency of exposure, the prevalence of the disease in the source population, the risk of transmission of the disease when exposure occurs and the efficiency of management after exposure. Needlestick injuries are responsible for 61.5% to 70% of accidental exposure cases.[2,3,4] Exposure may also occur from other sharp objects such as scalpels and broken glass,[4] as well as from mucosal exposure after splashing of blood or other bodily fluids.[5]

Seroconversion is more likely in cases of deep injury from a hollow-bore needle, visible blood on the needle, injury during a procedure involving placement of the needle in an artery or vein, or the death of the source patient with AIDS within two months after the exposure occurred.[6] Prophylaxis with zidovudine after exposure contributes to a decreased risk of seroconversion[6].

In 2005, the Human Sciences Research Council of South Africa estimated the prevalence rate of HIV in the general public to be 10.8%.[7] According to Steyn, the prevalence of occupational HIV is 0.3% after parenteral exposure, as opposed to 0.09% after mucosal exposure.[8]

The risk of contracting hepatitis B infection due to a needlestick injury is 100 times higher than that of contracting HIV. The prevalence ranges calculated for unvaccinated healthcare workers are 23% to 37% when the source patient is HBeAg-negative, increasing to 62% if the source patient is HBeAg-positive.[8]

In a Johannesburg-based study, 30.6% of healthcare workers tested positive for anti-HBs, indicating previous HBV infection or vaccination. However, only 21.2% of these healthcare workers could recall previous vaccination.[9] In Britain, 151 cases of occupational exposure to hepatitis B were reported, among which no seroconversions occurred. This may be due to successful vaccination.[2]

The time interval between exposure and the start of prophylaxis also plays a major role in the outcome. In many instances, a 28-day course of prophylaxis is not completed. This is most often due to the source patient being HIV negative – this was found to be true in 65% of cases in a study done by Russi ***et al***.[4] Another common reason for discontinuing prophylaxis is the occurrence of side effects, such as gastrointestinal complications (13%) and headaches (4%), or a personal choice after counselling (in 18% of cases)[4,10]

The risk of contracting acute hepatitis C infection due to a needlestick injury is estimated to range from 1%[4] to less than 5%.[11] Vardas found that 1.8% of healthcare workers in Johannesburg tested positive for HCV antibodies.[9] In Britain, no seroconversions were reported among 142 occupational exposures to hepatitis C.[2]

According to Mao ***et al***., the prevalence of HCV infection is higher in patients with co-existing HIV infection, with 15 to 30% of HIV-positive patients also infected with HCV.[12] HIV infection also accelerated the progression of HCV-related liver disease.

The aim of this study was to determine the extent and outcome of occupational exposure to bloodborne viruses amongst medical practitioners in Bloemfontein.

Methods

This descriptive study included doctors actively involved in public and/or private medical practice. Doctors not practising in the greater Bloemfontein area during the study period, or not active in clinical or laboratory work, were excluded. Questionnaires were given to all general practitioners and specialists in private practice listed in the current Bloemfontein telephone directory, as well as to the doctors employed at all clinical departments of the academic hospitals and at 3 Military Hospital. Questionnaires were delivered by hand so that new doctors not yet listed in the telephone directory could also be included in the study. The first author collected the questionnaires after a week. A pilot study was done with five doctors not working in Bloemfontein.

The limitations of the study design are that this study presents a "snap shot" of the problem, and selection and/or recall bias could have occurred. We sought to determine the outcome of occupational exposure. If, for example, a doctor's response to exposure was to leave the profession entirely or change the domain or department of practice, our study would not have appropriately identified him/her. The reliance on self-report by the respondents may also be a source of bias.

Written informed consent was obtained from the participants when they were asked to participate. The Ethics Committee of the Faculty of Health Sciences, University of the Free State approved the study. Data was collected from 9 June 2003 to 21 July 2003.

Frequencies and percentages were calculated for categorical data. For continuous data, medians and percentiles were calculated.

Results

A total of 441 questionnaires were delivered, and 228 (51.7%) completed questionnaires were returned. Unfortunately, no information is available concerning the characteristics of the non-respondents. Of the 228 respondents, 73% were male, and the median age of the respondents was 42 years (range 26 to 68 years).

Nearly half (48.2%) of the respondents were in private practice (19.7% as general practitioners and 28.5% as specialists), while 52.2% were employed in the public sector (academic hospitals or 3 Military Hospital).

More than half (54.2%, 95% confidence interval (CI) 47.7% to 60.5%) of the respondents (123 doctors) had previously been exposed to bloodborne viruses. Needlestick injury was the most common type of exposure (73.9%), followed by splash injuries (49.6%) and other sharp instruments (15.4%) (Doctors could indicate more than one type of exposure).

The respondents' occupational exposure according to clinical discipline is given in Table I (only 190 respondents answered this question. The prevalence of occupational exposure was found to be highest in the discipline of Obstetrics and Gynaecology (92.3%), followed by Orthopaedics (73.7%). General practitioners, grouped together with doctors working in the department of Family Medicine, demonstrated a risk of 62.5%. Most of the respondents (59.8%) were

Table I: Occupational exposure according to different clinical disciplines

Clinical disciplines (n=190)	Number of respondents exposed	Percentage
Casualty (n=2)	2	100
Family medicine (n=16)	10	62.5
Internal medicine (n=15)	9	60
Surgery (n=17)	11	64.7
Obstetrics and Gynaecology (n=26)	24	92.3
Anaesthesiology (n=14)	7	50
Paediatrics (n=12)	8	66.7
Orthopaedics (n=19)	14	73.7
Other (n=69)#	27	39.1

Other departments: Ophthalmology, Diagnostic Radiology, Urology, Dermatology, Anatomic Pathology and Plastic Surgery

exposed more than once (range 0 to 10 times).

The median age at the time of exposure was 35 years (range 26 to 67 years). Occupational exposure occurred most frequently in operating theatres (59.3%) and least in the doctors' surgeries (6.8%). Most of the respondents (85%) were exposed during procedures, as opposed to 11.7% who were exposed while cleaning up after procedures and 3.3% while moving a patient to a trolley, during intravenous transfusion and while drawing blood.

In half of the exposure cases (48.3%), the patients were known to be HIV positive, while in 23.3% of the incidents the patient's HIV status was unknown. Only 14 HIV-positive patients (12.1%) were symptomatic of AIDS and a small group of five patients (35.7%) were undergoing antiretroviral treatment. In 68.9% of cases, the patient was tested for HIV after occupational exposure had occurred, with 55% of these patients testing HIV positive. After exposure, 65.3% of the respondents were tested for HIV, with only 43.1% of these respondents undergoing follow-up tests after six weeks, 37.7% after six months and 29.8% after one year.

HIV antiretroviral drugs were taken by 40.2% of all the exposed respondents. Most of the respondents (73.5%) took antiretrovirals when they were exposed to a confirmed HIV-positive patient, mainly (63.3%) using a regime comprising two antiretroviral drugs. Unfortunately, 22.4% of the respondents could not remember which drugs they had used and 46.9% of the respondents could remember only one drug. Three antiretroviral drugs, namely zidovudine (AZT), lamuvidine and indinavir, were taken by 20.4% of exposed respondents.

A total of 67.4% of the exposed respondents completed a four-week antiretroviral course, with 16.3% using antiretrovirals for less than one week. Medication was mainly discontinued because of side effects (26.5%) and when the source patient was found to be HIV negative (12.2%). No respondent experienced seroconversion after occupational exposure to HIV.

In most cases (67.5%) of occupational exposure, the patient's HBV status was unknown. Only 4.3% of patients were known to be HBV positive, two were HBeAg positive and no data was available for the rest. Only 10.9% of the patients (11 patients) were tested for HBV after exposure and the data for 22 patients was not available. Of the 11 patients tested, three (27.3%) were HBsAg positive and one patient (9.1%) was HBeAg positive.

Only 21.7% of the exposed respondents underwent serological testing for HBV infection. Ten exposed respondents (8.7%) received prophylactic hepatitis B immunoglobulin, five within eight hours of exposure. However, the majority of exposed respondents (81%) indicated that they had previously been vaccinated against HBV infection.

Two exposed respondents underwent HBV seroconversion. In both cases the time interval from exposure to seroconversion was unknown. Neither respondent was vaccinated against HBV infection prior to exposure. The current HBV status of 44 (38.9%) of the exposed respondents is unknown and 10 respondents did not disclose their HBV status.

No source patient was known to be HCV positive, and only 11% were known to be HCV negative. After exposure, only 4.2% of the patients and 8.2% of the respondents underwent testing for HCV infection. No respondent reported HCV seroconversion. The respondents were not asked about their exposure to cytomegalovirus.

Discussion

No doctor in this study seroconverted to HIV, corresponding with the expected prevalence of 0.09 to 0.3% reported by Steyn.8 Two of the 228 respondents reported seroconversion to HIV, which resulted in a less than expected prevalence rate of 0.8%. This is possibly due to prior vaccination of the exposed doctors, as reported by Evans.2

The respondents were not aware of or concerned about the risk of contracting HCV, as only 8.2% underwent testing. Doctors should be more aware of HCV and the risk of being occupationally exposed to the virus, and serological testing for HCV should be performed routinely whenever occupational exposure occurs.

In accordance with the literature, needlestick injuries occurred most frequently, followed by mucosal exposure due to splash injuries and, least often, injuries from other sharp objects.[2,3,4] The questionnaire did not test factors related to a higher risk of seroconversion, e.g. the depth of penetration and the degree of contamination of the needle. The median age of exposure was 35 years, thus occupational exposure seemed not to occur more frequently in the earlier years of practice.

The difference in prevalence between disciplines may be due to the difference in the frequency and nature of procedures performed in these disciplines. The number of emergency procedures performed may also contribute to this fact.

Conclusion

Being occupationally exposed to any of the bloodborne viruses is a traumatic event with far-reaching consequences. The lack of adequate follow-up serological testing after occupational exposure is alarming. It is the responsibility of the occupationally exposed doctor to adequately comply with prophylactic measures and to undergo serological testing to ensure the least possible risk of contracting infection from a bloodborne virus.

References

1. Moloughney BW. Transmission and postexposure management of bloodborne virus infections in the health care setting: Where are we now? Canadian Medical Association Journal 2001;165(4):445-51.
2. Evans B, Duggan W, Baker J, Ramsay M, Abiteboul D. Exposure of healthcare workers in England, Wales, and

Northern Ireland to bloodborne viruses between July 1997 and June 2000: analysis of surveillance data. British Medical Journal 2001;322(7283):397-98.
3. Shiao J, Guo L, McLaws ML. Estimation of the risk of bloodborne pathogens to health care workers after a needlestick injury in Taiwan. American Journal of Infection Control 2002;30(1):15-20.
4. Russi M, Buitrago M, Goulet J et al. Antiretroviral prophylaxis of health care workers at two urban medical centers. Journal of Occupational and Environmental Medicine 2000;42(11):1093-100.
5. Haslett C, Chilvers ER, Hunter JAA, Boon NA. Davidson's principles and practice of medicine. 18th Edition. New York: Churchill Livingstone; 1999. p. 88.
6. Cardo DM, Culver DH, Ciesielski CA et al. A case-control study on HIV seroconversion in health workers after percutaneous exposure. Centres for Disease Control and Prevention Needlestick Surveillance Group. New England Journal of Medicine 1997;337(21):1485-90.
7. Shisana O. South African National HIV Prevalence, HIV Incidence, Behaviour and Communication Survey 2005. December 2005. http://www.comminit.com/strategicthinking/st2006/thinking-1569.html (Accessed 21/07/2006).
8. Steyn D. Post exposure prophylaxis regarding needlestick and sharps injuries. Paper delivered at SA Society of Anaesthesiologists Congress; 2002 May, 220-226.
9. Vardas E, Ross MH, Sharp G, McAnerney J, Sim J. Viral hepatitis in South African healthcare workers at increased risk of occupational exposure to bloodborne viruses. Journal of Hospital Infection 2002;50(1):6-12.
10. Centre for Disease Control. Serious adverse events attributed to nevirapine regimens for postexposure prophylaxis after HIV exposures worldwide, 1997-2000. MMWR Morbidity and Mortality Weekly Report 2001;49(51-52):1153-6.
11. Morand P, Dutertre N, Minazzi H, et al. Lack of seroconversion in a health care worker after polymerase chain reaction documented acute Hepatitis C resulting from a needlestick injury. Clinical Infectious Diseases 2001;33(5):727-9.
12. Mao Q, Ray SC, Laeyendecker O, et al. Human immunodeficiency virus seroconversion and evolution of the hepatitis C virus quasispecies. Journal of Virology 2001;75(7):3259-67.