Prevalence of Needlestick Injuries and other High Risk Exposures Among Healthcare Workers in Jamaica

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ABSTRACT

Objective: *To assess the prevalence of needlestick injuries (NSIs) and other high risk exposures among healthcare workers at two hospitals in Jamaica.*

Methods: *Employing a cross-sectional study design, medical personnel (physicians, nurses) at two hospitals in Jamaica, were studied, utilizing a structured questionnaire consisting of 14 items to collect data on needle stick injuries and other injuries.*

Results: *There were 67 needlestick injuries in 47 persons. Of those sustaining an injury, 52% of physicians and 40% of nurses had NSIs. Re-capping needles accounted for 21% of injuries, various minor procedures, 21%, injury during surgery, 19.4% and taking blood, 12%. In those sustaining NSIs, 47% were reported and 26% of reported cases received counselling.*

Appropriate blood tests were performed on 34% and post-exposure prophylaxis (PEP) for HIV was administered to 30%. Hollow bore needles caused 47.8% of injuries, 25.4% occurred with suture needles and 19.4% with intravenous branulas. Other occupational exposure was reported by 31%, including blood on hands and other body parts 39%, blood to face and eyes, 18%, splashed with liquor, 18%, splashed with bloody fluid, 11% and contact with vomitus and urine in eye, 4%.

Conclusion: *Needlestick injuries and other high risk exposures were high; incident reporting and post exposure management were inadequate. A comprehensive programme to address factors that contribute to the occurrence of NSIs and other occupational exposures is urgently needed.*

Keyword: Healthcare workers, needlestick

Prevalencia de las Lesiones por Punción con Aguja y Otras Exposiciones de alto Riesgo entre los Trabajadores de la Salud en Jamaica

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RESUMEN

Objetivo: *Evaluar la prevalencia de lesiones por punción con aguja (LPA) y otras exposiciones de alto riesgo entre trabajadores de la salud en dos hospitales de Jamaica.*

Métodos: *Empleando un diseño de estudio transversal, se estudió el personal médico (médicos y enfermeras) de dos hospitales en Jamaica. En el estudio se utilizó una encuesta estructurada de 14 puntos, para recoger datos sobre lesiones por punción con aguja y otros tipos de lesiones.*

Resultados: *Hubo 67 lesiones por punción con agujas en 47 personas. De las personas con heridas, 52% fueron médicos y 40% enfermeras que sufrieron lesiones por punción con agujas. El intento por recapar agujas dio cuenta del 21% de las lesiones; varios procedimientos menores, representaron el 21%; las lesiones durante cirugías, 19.4%; y la recogida de sangre, 12%. Entre los que tuvieron LPAs, 47% fueron reportados y el 26% de los casos reportados recibieron aconsejamiento. Se realizaron análisis de sangre apropiados en 34% y la profilaxis post-exposición (PPE) para el VIH se administró al 30%. Las agujas hipodérmicas causaron el 47.8% de las lesiones; el 25.4% ocurrieron con agujas de sutura, y 19.4% con bránulas IV. Otra exposición ocupacional fue reportada por 31%, incluyendo*

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sangre en las manos y otras partes del cuerpo, 39%; sangre en la cara y los ojos, 18%; salpicados con fluido corporal, 18%; salpicados con fluido sanguinolento, 11%; y contacto con vómito y orina en los ojos, 4%.

Conclusión: *Las lesiones por punción con agujas y otras exposiciones de alto riesgo fueron altas. Los reportes de incidentes y el tratamiento de la post exposición fueron inadecuados. Se necesita urgentemente un programa integral para abordar los factores que contribuyen a que se produzcan LPAs y otras exposiciones ocupacionales.*

Palabras claves: Trabajadores de la salud, aguja hipodérmica

West Indian Med J 2010; 59 (2): 154

INTRODUCTION

Needle stick injuries (NSIs) are wounds that occur when a needle or sharp instrument accidentally punctures the skin with the introduction of blood or other potentially infectious material into the body (1, 2). The major route of transmission of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) is exposure to infected blood and body fluids. Infections with these pathogens are potentially life-threatening but preventable. Healthcare workers (HCWs) use and come in contact with large quantities of needles and instruments for both diagnostic and therapeutic procedures. Therefore, NSIs are a hazard to this group and can occur at any time during the use, disassembling or disposal of needles and instruments. Factors that determine a HCW's risk of infection include the frequency of needlestick incidents, the pathogen involved, the immune status of the worker, the severity of the NSI and the availability and use of appropriate post-exposure prophylaxis [PEP] (3).

HIV affects more than 36 million persons worldwide, and in Jamaica, about 1.5% of the adult population is affected (2, 4). Needle stick injuries with contaminated needles from patients with HIV have an average risk of infection of 3 per 1000 injuries or 0.3% (1, 2).

About 300 million persons worldwide are carriers of the HBV and about 1% of blood-donors in Jamaica are positive (2, 5). Seroconversion after a single needle stick exposure to an HBV-infected patient is estimated to be 6–30% (1, 2). However, HCWs are not at risk for such exposures if they have antibodies to HBV from vaccination (6).

Hepatitis C virus infection is one of the most common chronic blood borne infections and the prevalence among blood donors in Jamaica is 0.4% (7). The risk of infection after a single needle stick exposure to infected blood averages 1.8% for HCV (1, 2). Currently, no vaccine exists to prevent HCV infection (6). The majority of infected individuals develop chronic liver disease.

Although NSIs are considered common occupational hazards for HCWs, available statistics underestimate the severity of the problem because many HCWs do not report their injuries. Therefore, it is not known how serious the problem is or how well prevention programme will work. Universal precautions and care to avoid injuries with sharps and instruments have been implemented to decrease the risk and prevent infection. In addition, immunization with the HBV vaccine is recommended as an important adjunct to universal precautions (8). However, when these exposures occur, the risk of infection can be significantly reduced by following protocols for PEP. Guidelines have been issued for the management of HCWs who have had occupational exposure to blood borne pathogens. This includes urgent evaluation of the source and exposed person's status along with the timely administration of hepatitis B immune globulin (HBIG), hepatitis B vaccine and/or HIV PEP where applicable. For HCV, testing should be performed to determine if infection develops (9–14).

In the Caribbean, one study has been reported from Trinidad and Tobago that looked at NSIs at two institutions (15). In Jamaica, however, limited data is available on needle stick injuries. This study was conducted among physicians and nurses to determine the prevalence of this important problem at two hospitals in Jamaica.

SUBJECTS AND METHODS

Employing a cross-sectional study design, medical personnel (physicians and nurses) at two hospitals in Jamaica, the St Ann's Bay Hospital (SABH) and Mandeville Regional Hospital (MRH) were studied. Located on the Northern coast, the 259-bed St Ann's Bay Hospital has on staff approximately 138 nurses and 76 physicians. Located in the centre of the island, the 210-bed Mandeville Hospital has on staff approximately 150 nurses and 70 physicians. The target population was a broad cross-section of practitioners and nurses from various specialty areas including Surgery, Accident and Emergency (A&E), Internal Medicine, Obstetrics and Gynaecology (O&G) and Paediatrics, in these two hospitals.

The senior medical officer and CEO of both hospitals were detailed about the study and they advertised the study to staff members. The study was advertised vocally to all staff members in each department. Each department was visited and the staff were given a detailed briefing on the study including its aims and objectives. They were advised that their participation was entirely on a voluntary and anonymous basis, and individual data would be kept confidential. Consecutive volunteers who accepted the invitation to participate in the study were included. A structured questionnaire consisting of fourteen (14) items was used to collect

the data. Questionnaires were given either in groups or alone as the opportunity arose. A researcher was present at all time during the collection of the data to answer questions and clarify concerns raised by the respondents.

Data obtained through this survey included personal information on respondents' age group, area of work and occupational status, occurrence of needle stick injury with a contaminated needle or instrument and the procedure followed after NSIs. Data were also obtained regarding exposures to other high risk body fluids. Procured data was kept confidential throughout the phases of data management and accessible only to the study team.

The entire data was analysed using version 12.0 of the Statistical Package for the Social Sciences (SPSS, Inc, Chicago, IL, USA). Descriptive statistics were produced as frequencies, percentages, means, standard deviations, medians and percentiles. Histograms of scale variables of interest were also created and visually assessed. Cross-tabulations of pairs of qualitative (categorical or ordinal) variables were produced and assessed using the chi-squared test of homogeneity and related tests of the strength of associations. The Kruskal-Wallis test was also used to assess the statistical significance of median differences in ranked data such as age categories by grouping variables such as specialty of respondents. Throughout, statistical significance was assessed at $p = 0.05$ or less.

RESULTS

One hundred persons participated in the study, 40 from Mandeville Regional Hospital and 60 from St Ann's Bay Hospital. There were 28% males and 72% females and this included 60% physicians and 40% nurses (all females); of the physicians 28 (47%) were males. Similar distributions were noted in both hospitals studied, with no difference in the male: female distribution or nurse: physician ratio. Most of the participants (83%) were in the 21–39-year age range, with 40% in the 21–29-year group and 43% in the 30–39-year group (Table 1). Nurses were older than physicians as 25% of the nurses were 40-years and older compared with 10% for physicians. On average, female physicians were younger than male physicians, 59.4% of female physicians were in the 20–29-year group compared with 32% for males. The specialty areas and status of the respondents are shown in Table 1. Males were more likely to work in surgery, 43%, compared with females, 7%. There were a total of 567 person years since graduation, with a mean of 6.2 (ranged 0.5 to 40) years. Nurses had more years since graduation than physicians, mean 7.8 *vs* 5.0 years. There was no significant difference in years since graduation in persons with a history of NSI (mean 5.6 year), compared with persons without injury (mean 6.3 year).

Ninety-six per cent of respondents indicated whether or not they were ever stuck with a needle; forty-nine per cent indicated a negative response and 47% indicated a positive response. Of the positive responders, 52% of the physicians (54% of male, 50% of female physicians) and 40% of nurses had NSIs. Sixty-seven injuries were reported in 47 respondents. There were no statistical differences between institutions, gender, age, specialty and status. The most common frequency of NSIs was once, (62%). Physicians were more likely to have multiple sticks, especially male physicians in surgery, up to or greater than 10 times. Nurses did not have more than five NSIs. Senior residents were more likely to have multiple injuries 40%, compared with junior residents, 11% and interns, 0%.

Of the reported injuries, 21% occurred while reheating needles; female physicians were more likely to be injured by this mode (Table 2). Suturing injuries (9%) commonly

Table 1: Demographic characteristics of healthcare workers

Demographics	No (%)
Age (years)	
< 20	0 (0%)
21–29	40 (40.8%)
30–39	42 (42.9%)
40– 49	12 (12.2%)
> 50	4 (4.1%)
Specialty area	
Surgery	19 (19%)
Accident and emergency	13 (15.5%)
Obstetrics and gynaecology	10 (10%)
Internal medicine	20 (20%)
Paediatrics	14 (14%)
Other	15 (15%)
Status	
Senior resident	9 (9%)
Junior resident	32 (32%)
Interns	18 (18%)
Nursing sister	3 (3%)
Midwife	5 (5%)
Registered nurse	24 (24%)
Enrolled nurse	11 (11%)

Table 2: Method of needlestick injury

	Nurses	Male Physicians	Female Physicians	Total
Recapping needle	5	2	7	14
Suturing	0	2	4	6
Placing needle in container	2	3	1	6
Surgery	0	11	2	13
Taking blood	0	4	4	8
Siting IV	0	3	0	3
Needle left in inappropriate place	3	0	0	3
During procedure	11	0	3	14
Total	**21**	**25**	**21**	**67**

occurred among male physicians. Injuries occurred with procedures (21%) such as nurses giving intramuscular injection or performing glucose readings at the bedside and female physicians reported injuries during procedures such as paracentesis and lumbar punctures. Also, 12% occurred during blood taking, with male and female physicians having equal risk. Injuries occurred in 9% while disposing of sharps, occurring equally across all subgroups. Placing intravenous access accounted for 7% of injuries, with 75% occurring in male physicians. Only 5% of injuries occurred as a result of needles left in an inappropriate place but nurses were involved for all of these injuries.

Twenty-eight per cent did not consider themselves at risk after the NSI for the following reasons: the nature of the injury and the presumed low risk (15%), the use of HIV post-exposure prophylaxis (8%), patient's HIV status known to be negative (23%) and care to observe universal precautions as much as possible (8%); 46% did not respond as to why they considered themselves low risk. There was no difference in gender, profession, age and status as to whether or not they considered themselves at risk.

Forty-seven per cent of the injuries were reported: nurses, 69%; female physicians, 50%; male physicians, 20%. Appropriate blood tests were performed in 34% and PEP for HIV was administered to 30% who had NSIs. Twenty-six per cent with NSIs were counselled (31% of nurses, 13.3% of male and 31% of female physicians). The probability that the injury would be reported and individuals counselled was not affected by status. Of the 47 persons that had NSIs, 61.7% of the source cases were HIV negative, 4.3% positive and in 27.7%, the patient's HIV status was unknown and 6.4% did not respond.

Hollow bore needles were associated with 47.8% of injuries, 25.4% with suture needles, 19.4% with IV branulas, 6% with lancets and 1.5% with scalpels. Among physicians, there were no statistical difference between males and females for injuries and there was no difference between institutions of injuries attributed to suture needles, lancet, hollow bore and IV branula. Lancet injuries were highest among nurses, 75%, and 25% occurred among female physicians. Injury with scalpels occurred only among male physicians. Participants working in the surgical area were at increased risk for NSIs ($p = 0.014$). Risk of injury with any of the sharps was not affected by age.

Other forms of occupational exposure were reported by 31%, and of these male physicians comprised 32%, female physicians – 26% and nurses – 42%. There was no statistical difference between gender, age and specialty. The commonest non-needlestick exposure was getting blood on the hands and other body parts (39%), female physicians were most at risk. Other exposures include blood to face and eyes, 18%, splashed with liquor 18%, splashed with bloody fluid, 11%, and contact with vomitus and urine in eyes, 4% (Table 3). Only nurses reported being splashed with liquor, had contact with vomitus and getting urine in the eyes.

Table 3: High risk exposure other than needle stick injury

	Nurses	Male Physicians	Female Physicians	Total
Blood on hands, body	2	4	5	11
Blood to face, eyes	1	2	2	5
Splashed with bloody fluid	2	1	0	3
Splashed with liquor	5	0	0	5
HIV positive cough to face	1	1	0	2
Vomitus	1	0	0	1
Urine to eye	1	0	0	1
Total	**13**	**8**	**7**	**28**

Ninety-five per cent were immunized for Hepatitis B. All physicians were immunized; 5% of nurses were not immunized. Only 64% were sure that their immunization was current, 66% of physicians (female physicians, 100%) and 79% of nurses' immunization was current.

Those who sustained a NSI wore gloves less often than those who did not have an injury (81% *vs* 91%). Thirty-two per cent of those who had a NSI and 44% of those who did not have an injury wore gloves all the time.

DISCUSSION

Recommendations for NSI post-exposure includes notifying the supervisor or occupational health and safety office, filling out an accident report and consulting the doctor or the hospital emergency department where the exposure can be evaluated, preparation made to evaluate the source, management commenced as it relates to the exposure and possible pathogens, counselling and follow-up as necessary (10).

Healthcare workers exposed to HIV should be evaluated within hours after exposure and HIV testing done at baseline to establish infection status at the time of exposure. For purposes of considering HIV PEP, the evaluation also should include information about medications the HCW might be taking and any current or underlying medical conditions or circumstances that might influence drug selection (10, 16). Post-exposure prophylaxis should be initiated as soon as possible. If questions exist about which antiretroviral drugs (ARV) should be used or whether to use a basic or expanded regimen, starting the basic regimen immediately rather than delaying PEP is probably better. Two drugs may be used for small volume exposures while a triple regime may be considered for large volume exposure. The optimal duration of PEP is unknown but probably should be administered for at least four weeks (10, 11). If the source person's HIV infection status is unknown at the time of exposure, use of PEP should be decided on a case-by-case basis after considering the type of exposure and the clinical

and/or epidemiologic likelihood of HIV infection in the source. Post-exposure prophylaxis with antiretroviral medications can reduce the risk of HIV transmission by 80% (3, 17).

In the present study, 47% of participants sustained NSIs and 25.5% received counselling; 34% had blood tests done and 30% took PEP. In Trinidad and Tobago, inoculation injuries occurred in 34% and 35 % of HCWs in two hospitals, with 72% occurring in nurses and 9.3% in doctors (15). It is believed that only one out of three NSIs are reported in the USA while these injuries virtually go undocumented in many developing countries (18). In a study in Japan, over a seven-year period, there were 259 cases of NSIs with 72.2% occurring in nurses and 55.9% of injuries were caused by needles (19). In another study in Australia, 47% of NSIs and 60% of body fluid exposures occurred in nurses, compared to 38% NSIs and 16% fluid exposures occurring in medical staff. Hollow bore needles accounted for 56% of NSIs with 11% occurring during recapping and inappropriate disposal (20). In the present study, 47.8% of injuries occurred with hollow bore needles and 52% of physicians and 40% of nurses sustained a NSI.

Ninety-five per cent of respondents were immunized against HBV, however only 64% reported that their immunization was current. In Jamaica, HBsAg was found in 5.3% of HCWs and carrier status was associated with years of service, this is compared with a carrier rate of 1% in blood donors (5). The incidence of infection with HBV has declined in healthcare workers in recent years largely due to widespread immunization (21). In many health facilities, the seroconversion status after vaccination is not assessed. In one survey only 6 workers (10%) had been tested for anti-HBs (18). In another study, 94% of subjects were found to seroconvert one month after vaccination for Hepatitis B (22). It is recommended that antibody testing be performed after completion of HBV vaccine, and if negative, a second three-dose vaccine should be administered and anti-HBsAg antibodies tested for again.

The risk of HBV infection is primarily related to the degree of contact with blood in the work place and also to the hepatitis B e antigen (HBeAg) status of the source person. In studies of HCWs who sustained injuries with HBV contaminated needles, the risk of developing clinical hepatitis if the blood was both hepatitis B surface antigen (HBsAg) and HBeAg-positive was 22–31% and the risk of developing serologic evidence of HBV infection was 37%–62%. By comparison, the risk of developing clinical hepatitis from a needle contaminated with HBsAg-positive, HBeAg negative blood was 1–6% and the risk of developing serologic evidence of HBV infection, 23–37% (10).

The hepatitis B vaccination status and the vaccine-response status (if known) of the exposed person should be reviewed along with the source HBsAg status. If the source is HBsAg positive and the exposed person was vaccinated and a known responder, no therapy is necessary. If however the response to vaccination is unknown, the exposed person should be tested, if there is an adequate response, no therapy is required. If the exposed person is a non-responder to HBV vaccine, HBV immunoglobulin (HBVIG) is administered and the person re-vaccinated (10). If the source is unknown and considered potentially high risk then therapy as if the source was HBsAg positive should be given (10). When HBIG is indicated, it should be administered as soon as possible after exposure, preferably within 24 hours. When HBV vaccine is indicated, it should also be administered as soon as possible and can be administered simultaneously with HBIG at a separate site. The vaccine should always be administered in the deltoid muscle (10). For exposed persons who are in the process of being vaccinated but have not completed the vaccination series, vaccination should be completed as scheduled and HBIG should be added.

The average incidence of anti-HCV seroconversion after accidental percutaneous exposure from an HCV-positive source is 1.8% (range: 0–7%). The risk for transmission from exposure to fluids or tissues other than HCV-infected blood also has not been quantified but is expected to be low (10). Institutions should establish policies and procedures for HCV after exposure to blood and ensure that all personnel are familiar with these. The following are recommendations for occupational HCV exposures: a) for the source, perform testing for anti-HCV, b) for the person exposed to a HCV-positive source, perform baseline testing for anti-HCV and serum transaminase (ALT). It is important to confirm all positive HCV results (10). Healthcare professionals who provide care to persons exposed to HCV in the occupational setting should be knowledgeable regarding the risk for HCV infection, counselling, testing and follow-up. Immunoglobulins and antiviral agents are not recommended after exposure to HCV-positive blood. However, limited data indicate that antiviral therapy might be beneficial when started early in the course of HCV infection. When HCV infection is identified, the affected person should be referred to a specialist knowledgeable in this area (10).

Resheathing needles is a problem of particular importance as compliance is relatively low and many injuries occurred as a result of re-capping needles (21%) in this study. Globally, needle stick injuries are the most common source of occupational exposures to blood and the primary cause of blood-borne infections of HCWs (9). The two most common causes of NSIs are two-handed recapping and the unsafe collection and disposal of sharps waste (23). It is documented that 10%–25% of injuries occurred while recapping a used needle (10). Determinants of NSIs include: overuse of injections and unnecessary sharps, lack of supplies (disposable syringes, safer needle devices and sharps-disposal containers), lack of access to and failure to use sharps containers immediately after injection, inadequate staffing, recapping of needles after use, passing instruments from hand to hand in the operating suite, lack of awareness of occupational hazard and lack of training (6, 23).

Factors that increased risk of transmission of HIV include a deep wound, visible blood on the device, a hollow-bore blood-filled needle, use of the device to access an artery or vein, and high-viral-load status of the patient (3). Seroconversion to HIV or HCV positivity can be delayed for months following infection, thus a negative test does not necessarily mean that the individual is not infected. In addition, medical treatment of emergency patients do not provide opportunity for testing prior to treatment. In the present study, 28% of those who had a NSI did not consider themselves at risk, primarily because they knew the patient's HIV status prior to the injury. It is important for HCWs to remember that over 20 pathogens have been reportedly transmitted from NSIs (17). The most serious are the transmission of HCV, HBV and HIV and the risk of acquiring HBV or HCV from NSIs is greater than for HIV (24).

The main limitation to the present study is the relatively small sample size, which may make the results difficult to generalize to the other hospitals in the country. Also, local conditions that are peculiar to the two areas studied may affect the findings although the hospitals sampled are fairly representative of the majority of public medical facilities in Jamaica.

In conclusion, the rate of NSI was high (47%), reporting of NSIs and management post-exposure were inadequate. This was affected by the participant's attitude to the injury and knowledge of the post-exposure protocol. Collaborative efforts by all HCWs are urgently needed to prevent injuries which may be achieved by a comprehensive programme that addresses institutional, behavioural, and other factors that contribute to NSIs in HCWs. Regular surveillance of HCWs are needed to monitor the prevalence of occupational hazards in hospitals.

ACKNOWLEDGEMENTS

The authors are grateful for the kind assistance given by the Research Resource Unit, Office of the Dean, Faculty of Medical Sciences, Mona. Dr SM Roofe, NERHA and Dr M Coombs, SRHA for their kind permission to conduct the study at the St Ann's Bay and Mandeville Regional Hospitals. Dr P Wellington and staff of Mandeville Regional Hospital and Dr H Betton and staff of St Ann s Bay Hospital.

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