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Needle-Stick Injury among Health Care Workers in Hemodialysis Units in Nigeria: A Multi-Center Study

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Abstract

Background: Needle-stick and sharps injuries carry the risk of infection and are occupational hazards for all health care professionals involved in clinical care.

Objective: To determine the frequency and factors contributing to needle-stick injury (NSI) among health care workers of dialysis units in Lagos, Nigeria.

Methods: Data were obtained by anonymous, self-reporting questionnaire from staff of 4 hemodialysis units between October and December 2011. Information on demographics, job category and duration, details of NSI in the past, kind of activity and procedure under which the NSI occurred, if injury was reported, vaccination status of staff, and post-exposure treatment received were obtained.

Results: The study population included 38 (37.3%) doctors, 42 nurses (41.2%), 14 (13.7%) dialysis technicians and 8 (7.8%) ancillary staff. There were 39 (38.2%) males. The mean±SD age of the study population was 34.4±8.3 years. 25 (24.5%) staff had suffered NSI in the last 12 months and 41 (40.2%) in their entire working career. The most common activity leading to NSI was recapping of needles (45%), improper disposal of needles (30%), and venous cannulation and setting of drips (27.5%). NSI was significantly ($p=0.016$) higher among those with work experience between 6 and 10 years than others. Hollow bore needles were responsible for 82.9% of the NSIs. Only 15 (37%) respondents reported their NSI to their unit head or designated officer in order to get medical advice.

Conclusion: In Lagos, Nigeria, NSI is common among hemodialysis staff and is under-reported. Many NSIs can be prevented by adhering to the practice of universal precautions as well as education of staff on such precautionary methods.

Keywords: Needle-stick injuries; Blood-borne pathogens; Health personnel; Vaccination; Infection control; Safety; Occupational exposure

Introduction

Hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) are the most serious of the 20 blood-borne pathogens. HIV infection, in particular, is a major

threat in the workplace due to the serious consequences it has on the affected worker.^{1,2} Health care workers (HCWs) are at increased risk of contracting blood-borne infections in their daily work through job-related factors like accidental needle-stick injuries (NSIs) and mucocutaneous expo-

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sure to blood and body fluids. NSIs are injuries caused by accidental penetration of the skin by an injection needle.³ Globally, NSIs are the most common source of occupational exposures to blood which result in transmission of blood-borne infections.^{2,4} Factors predisposing to NSI include overuse of injections, lack of supplies of disposable safe needle devices and sharps-disposal containers, short staffing, recapping of needles after use, type of procedures performed, passing instruments from hand to hand in the operating room, lack of awareness of hazard and lack of training.²

HCWs in developing countries, are particularly at increased risk of infections from blood-borne pathogens because of the high prevalence of such pathogens in their communities as well as the lack of basic personal protective equipment like gloves, gowns and goggles.^{2,4} In a study

from three health institutions from South-east Nigeria, Ansa, *et al*, observed that supplies of protective equipment were grossly inadequate and adherence to safety practices was poor, and all these could increase the risk of HCWs contracting blood-borne infections.⁵ It is estimated that about three million HCWs experience percutaneous exposure to blood-borne pathogens annually;^{6,7} two million are exposed to HBV, 0.9 million to HCV and 0.3 million to HIV.⁷ As a result of these injuries, 150 000 HCWs contract HCV, 70 000 HBV and 500 HIV.^{5,6} Most of these infections occur in the developing countries.^{6,7} The prevalence of NSI varies greatly across different countries and within the same country. The prevalence in Africa varies from 31% to 68%; it is 30.9% in Southern Ethiopia, 52.9% in Tanzania, 67.9% in Alexandria in Egypt and 68% among gynecologists in Nigeria.⁸⁻¹¹ In India, Muralidhar, *et al*, reported a prevalence of 80.1% in a large tertiary care hospital.¹² The occupational risk of NSI not only affects the quality of care delivered but also the safety and well-being of care providers.^{2,8} HCWs in the operating, delivery and emergency rooms and in laboratories have an increased risk of exposure.^{8,13} Similarly, cleaners, waste handlers and other workers involved in handling blood contaminated items are also at increased risk for NSI.¹³

Although 90% of the occupational exposures occur in the developing world, most of the reports of occupational infection are come from the USA and Europe.^{2,4} No study has been carried out on NSI among HCWs in hemodialysis units in Nigeria. Hemodialysis units are areas where strict infection control policies should be observed, given the potential risk of transmission of blood-borne infections to both staff and patients, if universal safety precautions are not followed. We therefore, carried out a multi-center cross-sectional study to determine the frequency and circumstances of NSI

TAKE-HOME MESSAGE

- The most common source of occupational exposures to blood is accidental needle-stick injuries (NSIs).
- Serious consequences of hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) infection in health care workers are important.
- Lack of basic personal protective equipment like gloves, gowns and goggles increase the risk of infection.
- The occupational risk of NSI not only affects the quality of care delivered but also the safety and well-being of care providers.
- Working in operating, delivery and emergency rooms and in laboratories have an increased risk of exposure. Cleaners, waste handlers and other workers involved in handling blood contaminated items are also at increased risk for NSI.
- Recapping of needles, improper disposal of needles, intravenous cannulation and setting of drips are the most common activity leading to NSI.

as well as post-exposure practices among HCWs in hemodialysis units in Lagos, Nigeria.

Materials and Methods

This multi-center cross-sectional study was carried out in four dialysis units in Lagos, Nigeria. The centers included two government and two private hemodialysis units and were studied between October and December 2011. We used a quota sampling method by first stratifying Lagos metropolis into two main zones—Lagos mainland, and Lagos Island. The dialysis units in each zone were further divided into private and public units. From each zone, we chose two units based on functionality and having full complement of staff of at least 10 or more. Excluded were units that were not fully functional and unwillingness to participate in the study. The four centers studied cared for about 60% of patients who receive dialysis treatment in Lagos metropolis.

The study was approved by the Research and Ethics Committee of one of the participating centers and informed consent was obtained from all participants after explaining the study objectives. All HCWs who were working in the selected dialysis units at the time of the study were taken as study population. Respondents were given an anonymous self-administered questionnaire to complete. Information sought was age of respondents, job category and duration, details of NSI in the past, kind of activity and procedure during which the NSI occurred, if injury was reported, vaccination status of respondents and post-exposure treatment received. Information on dialysis unit practice with regards to screening of staff and patients including policy on immunization of staff were obtained from the nephrologists and the nurse manager in charge of the various dialysis units.

Statistical analysis

Data analysis was done with Epi Info ver 6. Logistic regression analysis was used to determine the risk factors for NSI. A p value <0.05 was considered statistically significant.

Results

We disseminated 120 questionnaires, out of which 102 (39 [38.2%] men and 63 [61.8%] women) were returned, giving a response rate of 85%. The study population comprised of 38 (37.3%) doctors (20 medical officers/registrar and 18 interns), 42 nurses (41.2%), 14 (13.7%) dialysis technicians and other category of workers (ancillary staff) comprising 7.8% (including 4 cleaners, 2 ward maids and 2 laboratory attendants). The mean±SD age of participants was 34.4±8.3 (range: 22–57) years. About one-third of the respondents had been working for less than one year. Table 1 shows the demographic characteristics of

Table 1: Demographic characteristics of study sample and the frequency of needle-stick injury (NSI) among them

Variable	Total, n (%)	Needle stick injury, n (%)
Work category		
Registrars	20 (19.6)	12 (60)
Interns	18 (17.6)	7 (39)
Nursing Staff	42 (41.2)	19 (45)
Dialysis Technicians	14 (13.7)	3 (21)
Ancillary staff	8 (7.8)	0 (0)
Years of service		
<1	31 (30.4)	7 (23)
1–5	27 (26.5)	10 (37)
6–10	21 (20.6)	14 (67)
>10	23 (22.5)	10 (44)

Needle-Stick Injury in Hemodialysis Units in Nigeria

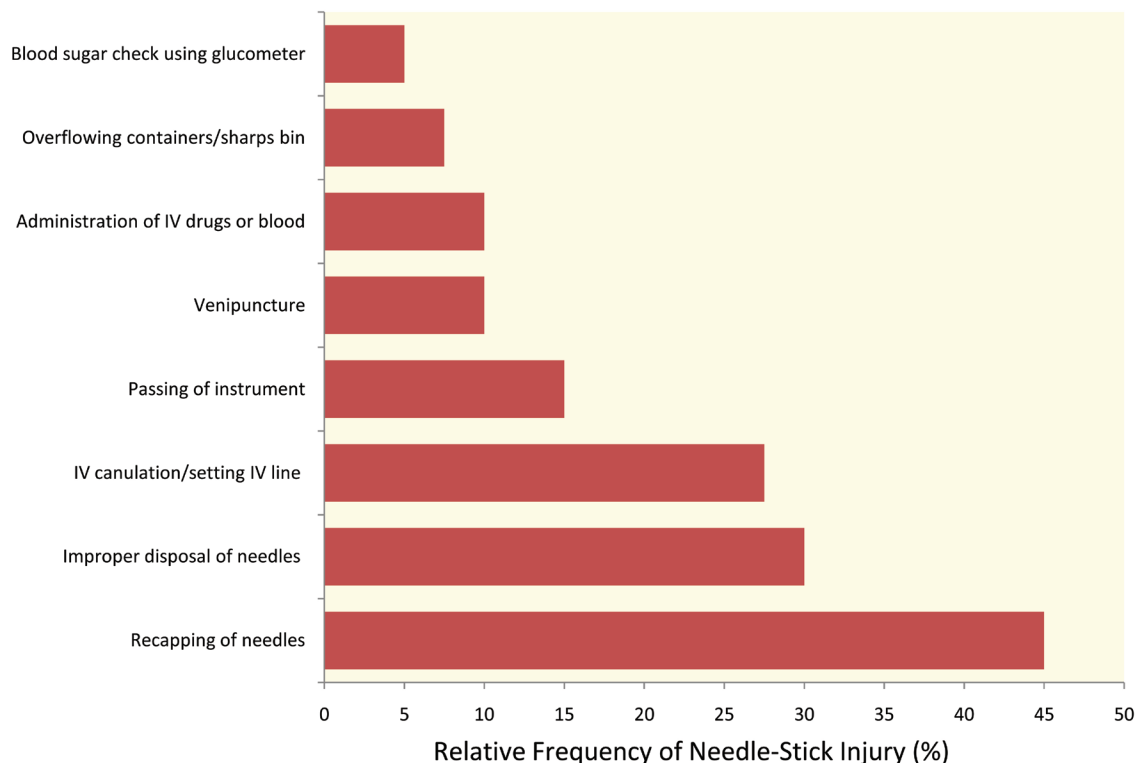


Figure 1: Causes of needle-stick injury among the study population

the study population.

Twenty-five (24.5%) respondents had experienced NSI in the last one year while 41 (40.2%) respondents had had at least one NSI in their entire working career. No significant difference ($p=0.158$) in the occurrence of NSI was observed among the major job categories. Registrars had the highest rate of NSI (60%) followed by nurses (45.2%), while technicians had the lowest rate (21.4%). Further analysis showed that registrars had a significantly ($p=0.026$) higher rate of NSI (60.0%) than technicians (21.4%). Table 1 shows the frequency of NSI stratified by job category and duration. None of the ancillary staff reported NSI in the past. In terms of gender distribution, 41% of male and 39.7% of female hemodialysis staff reported NSI ($p=0.834$). Life time prevalence of NSI was significantly ($p=0.016$) higher among

those with work experience between six and ten years than others. Hollow bore needles were responsible for 82.9% of NSIs.

The most common activity leading to NSI was recapping of needles (45%) followed by improper disposal of needles (30%); intravenous cannulation and setting of drips accounted for 27.5% of NSIs. Figure 1 shows factors contributing to NSI reported by respondents. Only 15 (37%) respondents with NSI, reported the event to their unit head or designated officer to get medical attention. In terms of action taken after NSI, all the respondents with NSI agreed to cleaning the site of injury immediately with soap and water. As a post-exposure prophylaxis, five (12%) respondents had their blood tested for HIV and HBV, three (7%) received anti-retroviral drugs, and one (2%) received hepatitis

B booster dose injection. The patient viral status for the NSI was “unknown” in eight (20%) of the cases; three (7%) NSIs were from HBV-positive patients, and two (5%) from HIV-positive patients; 28 (68%) cases were from patients who tested negative for HIV, HCV and HBV infections.

Logistic regression analysis showed that the independent risk factors associated with NSI among the study population were job category and years of service (Table 2). Being a technician was associated with 70% reduction in the odds of having NSI, while being on the job for more than five years was associated with 2.6 odds of having NSI in the entire working career.

Center screening and vaccination policies for staff

All the centers routinely screened their patients for HIV, HBV and HCV infections at presentation; only one out of the four centers routinely screened their staff members for blood-borne viral infections (HBV, HCV and HIV). However, in terms of voluntary self-screening, 52.9% of staff reported they had been screened for the three blood-borne infections in the past, 15.7% for both HIV and HBV, and 20.6% for HBV only; 10.8% had never been screened for any blood-borne pathogens. About one-third (32.4%) of the staff had a complete HBV vaccination, 30.4% did not complete their immunization and 37.2% were never immunized.

Discussion

HCWs are exposed to occupational hazard of injury with contaminated needles and sharps which could lead to blood-borne infections. In this study, about a quarter of the staff of the four dialysis units studied suffered NSI during the last year. This figure is similar to the report by Lee, *et al*, who reported a prevalence of NSI of 24.6% among 285 HCWs in a tertiary hospital in

Table 2: Risk factors for needle-stick injury among dialysis staff

Needle-stick injury	OR (95% CI)
Age (yrs)	0.97 (0.89–1.04)
Gender (Male/Female)	0.10 (0.40–2.47)
Job category*	0.30 (0.14–0.63)
Years of service [†]	2.57 (1.39–4.76)

*Technician vs registrar/medical officers
[†]Years of service ≤5 vs >5 years

Malaysia;¹⁴ however, it is slightly higher than 17.5% reported by Reda, *et al*, and 19% by Jacob, *et al*, from the UAE.^{15,16} This figure is however much lower than the rates reported from other studies.^{8,12,17-21} Muralidhar reported a prevalence of 80.1% in a tertiary hospital in India;¹² Chen, *et al*, reported a value of 71.3%;¹⁸ Nsubuga, *et al*, in Uganda reported a prevalence of 57%;²⁰ and in Nigeria, the prevalence among primary HCWs in Ilorin was 31.2%; it was 73% for HCWs working in five clinical departments at the Lagos University Teaching Hospital.^{3,22} In a study involving 317 HCWs from 32 hemodialysis units in Egypt, 48.6% of the HCWs reported NSI in the previous year.²¹ The lower rate among dialysis workers in our study is a reflection of the infection control policies instituted by all the studied centers including routine screening of all patients for HBV, HCV and HIV infections before dialysis as well as having dedicated machines for patients who tested positive to any of the blood-borne pathogens. Since the status of the patients is known to all HCWs, they usually will take extra-precaution in handling such patients. Doctors had the highest rate of NSI compared to nurses and technicians. Some studies have reported higher prevalence in doctors^{1,13,14,19} while others have reported higher prevalence among nurses^{12,8,15,23}. Reasons for these

For more information on sharps injuries among nurses in a Thai regional hospital see www.thejioem.com/ijournal/index.php/ijournal/article/view/109



differences include the compliance with safety procedures, availability of safety devices, and the type of procedure performed more frequently by doctors and nurses. In all the dialysis units studied, doctors do most of the invasive procedures, such as insertion of dialysis catheters for access assisted by the nurses; the senior nurses do needle artero-venous fistulae, while the technicians are concerned with machine maintenance. Petrosillo, *et al*, reported that nurses had the highest rate of sharps injury and skin or mucous membrane contamination because they do most of the invasive procedures in the dialysis units studied. Physicians were only involved in clinical management of the patients.²³ Surprisingly, none of the cleaners reported NSI, perhaps due to their small numbers.

The most common activity leading to NSI was recapping of needles. Studies from sub-Saharan Africa did show that recapping of needles was common among HCWs.^{3,8,15,24} Akeem, *et al*, observed that 78.5% of primary HCWs recapped needles.³ This is in contrast to reports from other studies in which NSI occurred during venepuncture, suturing, and administration of injections.^{1,12-14,17,19,22} In a study from nine dialysis units in Italy, most of the injuries occurred during removal of needles from the dialysis line.²³ The next common activity leading to NSI was improper disposal of needles. Salalekar, *et al*, found that 31.7% of NSIs occurred during sharps disposal.¹⁷ Improper disposal may be due to short supplies of sharps container as it was mentioned in a study from Southeast Nigeria.⁵ In general, recapping of needles by HCWs though prohibited, is still common in many developing countries and remains an important cause of NSI. HCWs should be educated about occupational risks associated with these harmful practices as well as on effective measures that can prevent such occupational exposures to blood-borne patho-

gens. These measures include eliminating unnecessary injections, eliminating needle recapping, proper disposal of sharps into a sharps container immediately after use, immunization against HBV, implementing universal precautions, the use of safer devices such as needles that sheath or retract after use, provision and use of personal protective equipment, and training workers in the risks and prevention of transmission.² Post-exposure prophylaxis with antiretroviral medications can reduce the risk of HIV transmission by 80%.²

The most common item involved in NSI was hollow bore needles. Hollow bore needles have been implicated as cause of NSI in other studies and they are important because they are associated with increased risk of transmission of infections.^{1,2,14,17} The most common action taken post-injury was for the affected staff to wash the site with soap and water. The recommended action to be taken following NSI or other potential exposure to a blood-borne pathogen is to immediately wash the site with soap and water; mucous membranes should be flushed with water.² Salelkar, *et al*, reported that 52% of their workers washed the injury site with soap and water; 71.5% applied an antiseptic solution.¹⁷

There was a low rate of reporting of NSIs in this study, which is consistent with previous reports.^{1,2,8,14,19} Research has shown 40% to 75% under-reporting of these injuries.² Several reasons have been adduced for the low reporting rate in most studies; these include the perceived low risk of transmission of infection, lack of laid down standard process of reporting and post-exposure prophylaxis, especially in developing countries, and lack of follow-up and workers' compensation.^{2,3} The low rate of reporting in this study may be due to the perceived low risk of transmission since 68% of the source of NSI was from patients who tested negative. It is important that most hospitals should develop

occupational and safety departments and standard process for reporting of NSI as well as continuous surveillance.

Only 7.3% of HCWs received post-exposure prophylaxis for HIV, 2.4% for HBV, and 12.2% had blood test carried out. Failure to report NSIs, lack of standard procedures for reporting NSI and non-availability of immunoglobulins/vaccines may compromise appropriate post-exposure management. In this study, only 32% of the staff completed their HBV immunization. This is very low compared to figures reported from developed countries where over 80% of staff were fully immunized against HBV.^{14,19} This trend is not good for clinical practice given the high rate of HBV infection in the community.^{2,4} There is need for a more proactive approach and change in policy in that all staff must be immunized against HBV infection, which is largely preventable by vaccination.

NSI is common among dialysis unit staff; most NSIs are under-reported. There is need to educate HCWs on safe practices. Provision of adequate protective gadgets will help to reduce occurrence of NSI. In addition, all dialysis unit staff must be screened for HBV infection and those found to be negative should be fully immunized to ensure full protection and reduce risk of transmission from HCWs to patients. All health care institutions should have a working needle-stick policy in their centers, and HCWs continually educated about it.

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