REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS IN REGIONAL HOSPITALS IN THE FREE STATE PROVINCE

BY

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DECLARATION

I, **Letshego Elizabeth Nophale,** hereby declare that this research is my own independent work. I further declare that this work is submitted for the first time at the University of the Free State, Faculty of Health Sciences, towards a Masters Degree in Social Sciences (Nursing) and it has never been submitted to any other university or faculty for the purpose of obtaining degree and all the sources that were used and quoted have been indicated and acknowledged as complete references.

..... Date: **.....**

L. E. Nophale

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..... Date: **.....**

L. E. Nophale

DEDICATION

This book is dedicated to my late grand parents, people who contributed to my upbringing, and I remember their traits, loving, and sharing whatever they had with those who are disadvantaged, Chobotsa Jeriel Mafata and Gabaikanngoe Mary Mafata. My beloved late mother, Masese Lydia Seeku, who always said nobody will take away your education from you and encouraged us as her children to be educated. Your inherited traits, which are: caring for others, sharing, taking care of other's needs and forgetting about yourself when assisting others, will be cherished forever. You will always be remembered and loved, you are missed in such achievements that you cannot witness as a mother, a friend and support system. I salute you.

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AIDS	Acquired Immunodeficiency Syndrome
ANHOPS	Association of National Health Occupational Physicians
ANA	American Nurses Association
ADEM	Auburn Department of Environmental Management
ARV	Antiretroviral
BBFE	Blood and body fluid exposure
BBPs	Blood Borne Pathogens
BSI	Body Substance Isolation
CDC	Centers for Disease Control and Prevention
CCMT	Comprehensive Care Management and Treatment
CEOs	Chief Executive Officers
CI	Confidence Interval
CHCHWs	Correctional Health Care Workers
DoH	Department of Health
DRMS	Department of Risk Management and Safety
ECP	Exposure Control Plan
EPINet	Exposure Prevention Information Network
ESIPD	Engineered Sharps Injury Prevention Device
GPA	Global Plan of Action
HCWs	Health care workers
HPA	Health Protection Agency
HBV	Hepatitis B Virus
HBeAg	Hepatitis B e-antigen
HBsAg	Hepatitis B surface antigen
HCV	Hepatitis C Virus
HICPAC	Hospital Infection Control Practices Advisory Committee
HAI	Hospital Acquired Infections
HIV	Human Immunodeficiency Virus
IEC	Information, Education and Communication
IOD	Injury on Duty
ILO	International Labour Organization
LA	Laboratory autopsy

MIOSHA	Michigan Occupational Safety and Health Administration
MBBS	Bachelor of Medicine, Bachelor of Surgery
NIOSH	National Institute of Occupational Safety and Health
NSIs	Needle stick injuries
OHASA	Occupational Health and Safety Act No 85 of 1993
OHNP	Occupational Health Nurse Practitioner
OHC	Occupational health clinic
OR	Odd ratio
OSHA	Occupational Safety and Health Administration
PC	Patient care
PPE	Personal Protective Equipment
PEP	Post Exposure Prophylaxis
POHU	Province Occupational Health Unit
PHC	Primary Health Care
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
SA	South Africa
SPs	Standard Precautions
Ups	Universal Precautions
US	United States
WHO	World Health Organization

CHAPTER ONE: ORIENTATION TO THE STUDY

1.1 BACKGROUND AND INTRODUCTION

The World Health Organization reported that amongst the 35 million health care workers (HCWs) worldwide, between 2 - 3 million are frequently exposed to percutaneous injuries through contaminated sharps with patients' blood and /or body fluids (Wilburn & Eijkemans, 2007:451 and Orenstein, Reynolds, Karabaic, Lamb & Markowitz, 2000:21). According to Wilburn and Eijkemans (2007:451) there is unfortunately a 40% – 75% underreporting of percutaneous injuries. Sharps which cause percutaneous injuries, for example, contaminated needles, can transmit blood borne infections (Wilburn & Eijkemans, 2007:451 and Orenstein *et al*. 2000:21). According to these authors there are different blood borne infections that can be transmitted through needle stick injuries (NSIs) for example the Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV), Diphtheria, Gonorrhoea, Syphilis and Haemorrhagic fever. These blood borne infections, Hepatitis C Virus (HCV), amongst others, has no vaccine available for either pre- or post exposure. Hepatitis C Virus (HCV), infection can at a later stage progress to liver diseases and/or cancer of the liver. The risk of infection following a needle stick injury (NSI) from an infected patient is 0.3% for Human Immunodeficiency Virus (HIV), 3% for Hepatitis C Virus (HCV), and 6%-30% for Hepatitis B Virus (HBV) (WHO, 2003:Online). In developing regions, 40%–65% of Hepatitis B Virus (HBV) infections in health care workers (HCWs) are attributed to percutaneous occupational exposure (Prüss-Üstün & Rapiti, 2003:Online).

Hospitals are workplaces where health care workers (HCWs) are exposed to blood and other body fluids in the course of their work. Health care workers (HCWs) are exposure prone and at risk of being infected with blood borne diseases on a daily basis as in the course of their work they handle patients' blood and body fluids. HCWs can sustain needle stick injuries (NSIs) when using sharp instruments while performing minor and major surgery in procedures such as insertion of intravenous drips, administering medication by injection and collecting and disposing of medical waste (Alamgir, Cvitkovich, Astrakianakis, Yu & Yassi, 2008:12; Wilburn & Eijkemans, 2007:451 and Kim, Martin & Denny, 2003:Online).

According to Stevens and Dickinson (2007:41–48) being exposed to HIV infection has double implications for HCWs. Through needle stick injuries (NSIs) they are at risk of occupational exposure to Human Immunodeficiency Virus (HIV) and have to bear the fear of acquiring occupationally transmitted Human Immunodeficiency Virus (HIV). Added to this they are anxious because of the stigma attached to Human Immunodeficiency Virus (HIV) and the possibility of being discriminated against by others (Stevens & Dickinson, 2007:41–48).

The Free State Department of Health (DoH) reported an alarming 14% increase of Human Immunodeficiency Virus (HIV) infections in 2005 (Dorrington, Bradshaw, Johnson & Budlender, 2005:Online). In a presentation done by Shai-Mhatu in 2006, she reported that in the Free State Department of Health's (DoH) Comprehensive Care, Management and Treatment (CCMT) of HIV and AIDS Programme, statistics for the period 1 October 2005 to 31 December 2005 has shown a total of 11,063 HIV positive patients (Shai-Mhatu, 2006:presentation).

Based on the above information, it seems that the safety of a vast number of employees may be threatened should they be exposed to blood borne infections due to needle stick injuries (NSIs). Oswald (2007:64-73) on the other hand indicated that HCWs who are infected with blood borne illnesses cause the DoH employers profound ethical and legal problems. While employers seek to protect HCWs from the threats of blood borne infections and respect their human rights when working with infected patients, the employers should in an effort to obtain patient's informed consent for knowing the patient's health status, simultaneously recognize the patient's human rights to withhold such consent. Employers are legally bound to establish and maintain, as far as is reasonably practical, a healthy and safe working environment for the HCWs according to the South African Occupational Health and Safety Act and Regulations (South Africa. Occupational Health and Safety Act 1993:Section 8).

1.2 PROBLEM STATEMENT

Cowles (2004:43) in his article “The point of the matter” said: “Despite technological advances and increased awareness, thousands of nurses are stuck by needles each year”. According to Cowles most of NSIs happen after use and before disposal of the sharps. The author indicated that “… your work environment, combined with your responsibilities could increase your risk of an injury depending on how many of the above mentioned categories apply to you”. The risk of NSIs thus will remain an issue of concern until it is investigated and measures put in place to avoid such needle stick injuries.

The researcher is a qualified occupational health nurse practitioner (OHNP), currently working at the Free State Province Occupational Health Unit (POHU). One of the Free State Province Occupational Health Unit’s (POHU) strategic objectives (2005-2007:4-5) is to identify, conduct and support occupational health and safety research in the Free State Province and to make recommendations. The Free State Province Department of Health (DoH) public health sector hospitals structure has 31 (academic, regional and district hospitals), 3 central laundries and 1 corporate office (Bophelo House). Each structure has an occupational health clinic (OHC) managed by a qualified occupational health practitioner, rendering services to HCWs (See Figure 1.1).

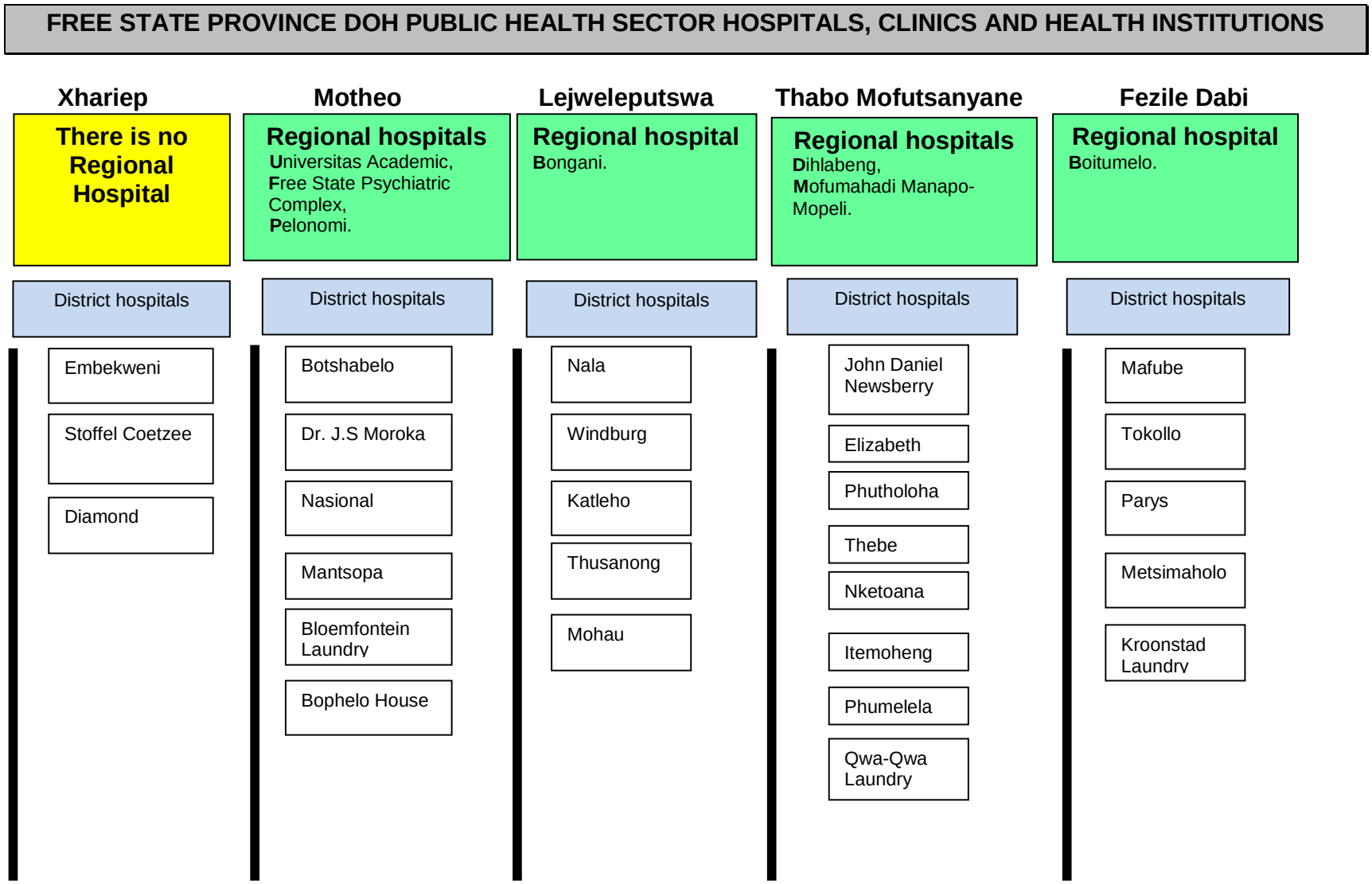


Figure1.1: Free State Department of Health (DoH) public health sector hospitals and health institutions

[1] Universitas Academic hospital and Free State Psychiatric complex were included with all the regional hospitals in the study

Furthermore, the researcher receives on a monthly basis the statistics of needle stick injuries (NSIs) amongst HCWs in the Free State Province Department of Health (DoH) public health sector regional and district hospitals from the OHNPs as reported at the occupational health clinics and documented in the Injury on Duty (IOD) register (as indicated in Figure 1.1). These statistics of NSIs for the period January 2006-June 2007 raised the researcher's concern. The concern was that the statistics for needle stick injuries amongst HCWs was high and needed to be investigated.

Due to the high reported NSIs statistics amongst HCWs, and as part of her job description, the researcher needed to investigate the reason(s) for the high reported NSIs. The problems were confirmed during walkthrough surveys done from 2001-2006 in all 31 hospitals (Figure 1.1). The motivation for the walkthrough surveys was to assess occupational health risks and hazards that HCWs are exposed to and also assessing control measures that are in place. Gaps were found during the surveys concerning the implementation of the DoH's occupational health policies. Firstly, waste management and infection control which was not compliant with the policy. Secondly, safety measures to protect HCWs against NSIs in the work place were not in place, for example, all the 31 hospitals had no provincial policy on infection control. Thirdly, the policy in use for post exposure to NSIs and management of blood borne infections was last reviewed in 1998 in the Health Circular 5 of 1998. And fourthly, hospitals were still using unsafe needles (non-retractable) and intravenous drip insertion devices that were not safe.

The researcher decided to investigate reported needle stick injuries (NSIs) amongst health care workers (HCWs) working in the Free State Province Department of Health (DoH) public health sector regional hospitals (See table 1.1). District hospitals were not include for the study as they had less numbers of reported NSIs for the period January 2006-June 2007.

Table 1.1: Statistics on reported Needle Stick Injuries (NSIs) in the Free State Province Department of Health (DoH) Public Health Sector Regional hospitals: January 2006 to June 2007

		PROFESSIONAL HCWS				SUB PROFESSIONAL HCWS	
District	**Regional Hospitals**	**Doctors**	**Professional Nurses**	**Staff Nurses**	**Auxiliary Nurses**	**General Assistants**	**TOTAL**
Lejweleputswa	Bongani	**4**	**1**	_	**1**	**2**	**8**
Motheo	Free State Psychiatric Complex		**1**	**-**	_	**-**	**1**
	Pelonomi	**14**	**7**	**1**	**2**	**6**	**30**
	Universitas Academic	**13**	**10**	**2**	**5**	**4**	**34**
Fezile Dabi	Boitumelo	**4**	**1**	_	_	**2**	**7**
Thabo-Mofutsanyane	Mofumahadi Manapo Mopeli	**7**	_	**2**	**2**	**1**	**12**
	Dihlabeng	**4**	**6**	_	**2**	**1**	**13**
Xhariep	None	_	_	_	_	_	_
TOTAL		**46**	**26**	**5**	**12**	**16**	**105**

1.3 AIM

The aim of the study was to investigate reported needle stick injuries (NSIs) amongst health care workers (HCWs) in regional hospitals in the Free State Province.

1.4 OBJECTIVES

More specifically the Objectives of this study were to:

- Describe the reported needle stick injuries amongst different categories of HCWs working in the Free State Province Department of Health (DoH) public health sector regional hospitals;
- Describe practices leading to needle stick injuries amongst different categories of HCWs working in the Free State Province Department of Health (DoH) public health sector regional hospitals as mentioned in Table 1.1;
- Describe the management of needle stick injuries in the Free State Province Department of Health (DoH) public health sector regional hospitals, and
- Make recommendations to the Free State Province Department of Health (DoH) public health sector regarding prevention and management of NSIs.

1.5 RELATIONSHIPS BETWEEN CONCEPTS

There seems to be a relationship between NSIs, the practices of HCWs and the management of needle stick injuries (NSIs) as indicated in Figure 1.2. The Exposure Prevention Information Network (EPINet) reported that the practices in a number of health care facilities expose HCWs to NSIs, for example, re-use of blood tube holders with removable needles increases the risk of HCWs to receive NSIs whilst removing contaminated needles (EPINet, 2003:Online). As was mentioned earlier by the Global Plan of Action (GPA) on Workers' Health (2008-2017), there is a need to define the essential interventions for prevention and management of different types of risks and hazards in the working environment (Rantanen, 2007:Online). Failure to develop policies, guidelines or protocols as interventions for management of NSIs will further expose HCWs to blood borne infections.

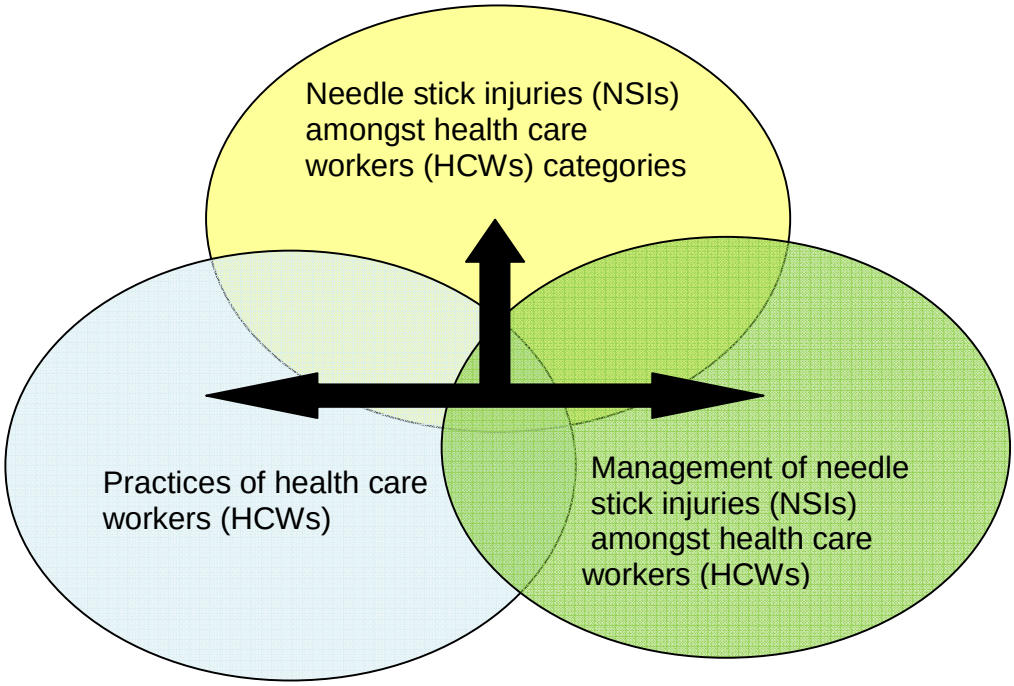


Figure 1.2: Relationships between the different concepts guiding the study

1.6 CLARIFICATIONS OF CONCEPTS

1.6.1 FREE STATE PROVINCE

It is one of the nine (9) provinces of South Africa. The name is derived from the former Orange Free State and it is now called the Free State Province (Wikipedia, 2005:Online) and consists of five districts namely Motheo, Thabo Mofutsanyane, Xhariep, Lejweleputswa and Fezile Dabi. All the districts will be included in this study except Xhariep district, because it has no regional hospital.

1.6.2 HEALTH CARE WORKERS (HCWs)

Verow, Blair and Lees (2004:4-5) in the Association of National Health Occupational Physicians (ANHOPS), defines three categories of health care workers:

- Clinical and other staff, including those in primary health care, who have regular clinical contact with patients. This includes staff such as doctors, nurses, dentists; and paramedical professionals such as occupational therapists, radiotherapists and ambulance workers;

- Laboratory and other staff (including mortuary staff) who have direct contact with potentially infectious clinical specimens and in addition can be exposed to pathogens in the laboratory;
- Non-clinical ancillary staff that may have social contact with patients, but not usually of a prolonged or close nature. This group includes receptionists, ward clerks, other administrative staff working in hospitals and primary health care settings, as well as maintenance staff such as engineers and cleaners (Verow, Blair and Lees, 2004:4-5).

The WHO and International Labour Organization (ILO) (WHO & ILO, 2005:Online) stated, at a meeting held in Geneva, that the HCW is a person (e.g. nurse, physician, pharmacist, technician, mortician, dentist, student, contractor, attending clinician, public safety worker, emergency response personnel member, health care waste worker, first aid provider or volunteer), whose activities involve contact with patients or with blood or other body fluids from patients.

In this study health care workers (HCWs) are defined as persons whose activities involve contact with patients, blood or other body fluids and include: doctors, professional nurses, staff nurses, auxiliary nurses and general assistants and are working in the Free State Province Department of Health (DoH) public sector regional hospitals of the four districts namely: Motheo, Thabo Mofutsanyane, Xhariep, Lejweleputswa and Fezile Dabi as indicated in Table 1.1. All the districts will be included in this study except Xhariep district, because it has no regional hospital.

1.6.3 NEEDLE STICK INJURY (NSI)

A needle stick injury (NSI) means the introduction of blood or other potentially infectious material by a hollow bore needle into the body of a health care worker (HCWs), during the performance of his/her duties (Anon, 2003:Online). In this study a needle stick injury (NSI) is defined as any injury caused by different types of needles, irrespective of the purpose of use.

1.6.4 OCCUPATIONAL HEALTH AND SAFETY ACT NO 85 OF 1993

The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) of is a specific Act that ensures the health, safety and the protection of employees against hazards arising out of or in connection with the activities at work (South Africa. Occupational Health and Safety Act 1993:5). In this study reference is made to this Act.

1.6.5 OCCUPATIONAL HEALTH SERVICES (OHS)

The International Labor Organization's (ILO) Convention on Occupational Health Services (No.161) and the ILO's Recommendations on Occupational Health Services (No.171) were adopted in 1985. At the convention the following definition for the Occupational health services was given: "The term 'occupational health services' means services entrusted with essentially preventive functions and responsible for advising the employer, the workers and their representatives in the undertaking, of the:

- requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work, and
- adaptation of work to the capabilities of workers in the light of their state of physical and mental health" (ILO, 1985:Online).

In this study occupational health services were services entrusted with essentially preventive, curative and rehabilitative functions (OHC clinics) and is responsible for advising the HCWs working in the Free State Province Department of Health (DoH) public health sector regional hospitals.

1.6.6 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment (PPE) is equipment designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, PPE includes a variety of devices and

garments such as goggles, overalls, gloves, vests, earplugs and respirators (WHO & ILO, 2006:Online). Personal protective equipment in this study were face shields, safety glasses, safety shoes and attire such as goggles, gloves and aprons.

1.6.7 POLICIES

According to Tomey in Booyens (1998: 200) policies "… explain the steps to be followed in achieving goals: they serve as the basis for future decisions and actions, help co-ordinate plans, control performance, and increase consistency of action by increasing the probability that different managers will make similar decisions when faced by similar situations. Policies also serve as a means by which authority can be delegated". Policies referred to in this study were the policies that originated at the top level of management as well as the first line managers to co-ordinate plans, control performance, and increase consistency of action in the Department of Health (DoH).

1.6.8 POST EXPOSURE PROPHYLAXES (PEP)

Spink (2008:1-7) states that post exposure prophylaxes (PEP) is antiretroviral (ARV) drugs or treatment that is provided immediately after someone is exposed to blood and body fluid which could transmit blood borne infections, for example HIV, HBV and/or HCV. It is immediate provision of medication following an exposure to potentially infected blood or other body fluids in order to minimize the risk of acquiring an infection. In addition, the International Labor Organization (WHO & ILO, 2006:Online) describe PEP as preventive therapy or "primary prophylaxis" given to at-risk individuals to prevent a first infection; "secondary prophylaxis" is given to prevent recurrent infections.

1.6.9 PRACTICES

Practices are the actual doing of things or doing something repeatedly to improve your skills (Stevenson, 2000:541). In this study practices were the manners or ways in which HCWs performed their duty in accordance with written policies and procedures in the workplace.

1.6.10 PROCEDURES

According to Tomey (2000:175) procedures are defined as the chronological sequence of steps within a process. In this study procedures were the work activities that direct the HCWs to perform clinical procedures in the workplace. Procedures are a set of written guidelines (standards) or hospital sub-regulations that legally guides the health care workers (HCWs) in the Free State Province DoH public sector regional hospitals, on how to perform their duties.

1.6.11 REGIONAL HOSPITAL

According to the Free State Provincial Government a regional hospital is a level two hospital, rendering a secondary level of health care, to patients from the Primary Health Care (PHC) setting and District Hospitals (Cullinan, 2006:Online). In this study the Free State Province DoH public sector regional hospitals in four of the five districts were used namely Universitas Academic hospital, Pelonomi hospital and the Free State Psychiatric Complex in the Motheo district; Dihlabeng hospital and Mofumahadi Manapo Mopeli in the Thabo Mofutsanyane district; Bongani hospital in the Lejweleputswa district as well as Boitumelo hospital in the Fezile Dabi district. The Xhariep district was excluded as it has no regional hospital. In this study Universitas Academic and Free State Psychiatric Complex occupational health clinics (OHC) are included with all the regional hospitals.

1.6.12 STANDARD PRECAUTIONS

Standard precautions are those measures taken to prevent transmission of infection during the provision of health care services and include methods of handling waste products, as well as universal precautions to prevent exposure to blood or other body fluids, taken with all patients regardless of diagnosis (Jeong, Cho & Park, 2008:739; & CDC, 2005:Online). In this study, standard precautions were all the measures taken to prevent cross infection.

1.7 RESEARCH METHOD AND DESIGN

A quantitative method was used to provide a picture of the situation as it naturally happen (Burns & Grove, 2005:281). The research design for this study was a non-experimental design, which was descriptive and retrospective in nature.

1.8 RESEARCH TECHNIQUES

In quantitative research, data can be collected by means of different research techniques such as questionnaires, checklists, indexes and scales (De Vos, Strydom, Fouché & Delport, 2004:170). Burns and Grove (2005:368) describe measurement as "… the process of assigning numbers to objects, events or situations in accordance with some rule". The numbers assigned according to Burns and Grove (2005:368), can "... indicate numerical values or categories". Measurement begins by clarifying or defining the object, characteristic, or element to be measured. Only then can strategies or techniques be developed to measure it (Burns & Grove, 2005:368). In this study the research technique used was a questionnaire.

1.8.1 LITERATURE STUDY

The researcher developed a questionnaire based on an extensive literature review, existing questionnaires on NSIs and documents regarding policies and procedures available in the Free State Province Department of Health (DoH) public health sector regional hospitals, as well as information gained from the review of existing questionnaire from the Exposure Prevention Information Network (EPINet).

1.8.2 QUESTIONNAIRE

A questionnaire could be defined as "…a method of gathering self-report information from respondents through administration of questions in a paper-and-pen format" (Polit & Beck, 2004:469). Types of questionnaires include mailed, telephonic, self-administered, hand delivered and group-administered questionnaires (De Vos *et al*. 2004:174). In this study the researcher used a questionnaire to collect data.

The questionnaire used in the study questioned all respondents about their needle stick injuries (NSIs), their practices relating to needle stick injuries (NSIs) and their management of post exposure to needle stick injuries (NSIs). The researcher made use of field workers for administering the questionnaires at the occupational health clinics (OHC). These fieldworkers were the occupational health nurse practitioners (OHNPs) in charge of the occupational health clinics (OHC). Questionnaires vary in their degree of structure through their combination of open ended and closed questions (Polit & Beck, 2004:334). Open ended questions allow respondents to respond in their own words whilst closed questions offer respondents a number of alternative replies, from which the respondent must choose the one that most closely matches the appropriate answer. The choice was between a simple yes or no (Polit & Beck, 2004:334). This study used both open ended and closed questions because during the interview there was a need to explain and describe how needle stick injury had occurred.

1.8.3 INTERVIEW

An interview is structured or unstructured verbal communication between the researcher and the subject, during which information will be obtained for the study (Burns & Grove, 2005:811-812). The researcher used a questionnaire as the data collection tool; respondents were interviewed face to face by the researcher and or field workers which were the occupational health nurse practitioners (OHNPs) of the different Free State Province Department of Health (DoH) public health sector regional hospitals (Figure 1.1).

1.9 POPULATION

Burns and Grove (2005:47) define a population as all the elements that meet certain criteria for inclusion in a given universe. The population in this research was formed by all the HCWs namely the doctors, professional nurses, staff nurses, auxiliary nurses, and the general assistants who reported NSIs at the different occupational health clinics (OHCs), and documented in the Injury on Duty (IOD) register from Free State Province Department of Health (DoH) public health sector regional hospitals in the different districts as indicated in Table 1.1. These reported NSIs had occurred during the period

January 2006-June 2007. The total population in this study was 105.

1.10 SAMPLING

Polit and Beck (2004:291) defines sampling as the process of selecting a portion of the population to represent the entire population whilst Burns and Grove (2005:365) indicate that sampling involves selecting a group of people with which to conduct a study. In this study no sampling was done. The entire population (105) was included. Five HCWs, one from each HCWs category, formed part of the pilot study and their results were not included for data analysis.

1.10.1 INCLUSION CRITERIA

According to Burns and Grove (2005:367) inclusion criteria are characteristics that must be present for the element to be included in the sample. The following inclusion criteria were adhered to:

- Only HCWs who reported NSIs and whose injury was documented on the occupational health clinic (OHC) injury on duty (IOD) register;
- HCWs who were working in the Free State Province Department of Health (DoH) public health sector regional hospitals at the time of a NSIs in the four (4) districts of the Free State Province, namely, Motheo, Fezile Dabi, Thabo Mofutsanyane and Lejweleputswa, and
- Only doctors, professional nurses, staff nurses, auxiliary nurses and general assistants who reported NSIs were included.

1.10.2 EXCLUSION CRITERIA

The following is a list of factors according to which HCWs and hospitals were excluded from the study:

- District hospitals were not included for the research as the ward/department or unit set-up differ per hospital, per district and from regional hospitals which would make it difficult to compare the work area;

- The Xhariep district has no regional hospital and was therefore excluded;
- HCWs who were not full time employees for example all students who sustained NSIs, were excluded from the study as well as part time HCWs or contract HCWs;
- HCWs who sustained NSIs after the period September 2007, and
- HCWs who sustained NSIs but did not report to the occupational health clinics, and were not documented in the IOD registers.

1.11 PILOT STUDY

A pilot study is a small scale study or trial run for a major study done to obtain information for improving the projects or assessing its feasibility and to give the researcher experience with the subjects, setting, and methodology as well as to refine the data collection instrument (Polit, Beck & Hungler, 2001:467). A random selection was done for the pilot study, whereby the researcher wrote all names of the study population each on a separate piece of paper. She then put the names of the different categories of the doctors, professional nurses, staff nurses, auxiliary nurses and general assistants (separate) in a hat and selected one per health care worker (HCW) category. One (1) respondent per category of HCW as selected were interviewed for the pilot study. These respondents were excluded from the main study. The Pilot study was done at Universitas hospital as the hospital had a high number of reported NSIs and secondly it was cost effective for the researcher as there were no travelling expenses. The five (5) respondents who participated in the pilot study were excluded from the main study and the data obtained did not form part of the final results.

The pilot study was done in order to test the questions, to ascertain whether they were clear and comprehensive enough to be used for the main study and to obtain valid data for analysis. The findings of the pilot study highlighted a number of areas which needed to be modified. The researcher discussed the results of the pilot study outcome with the two study supervisors, the domain experts and the biostatistician in order to benefit from their expertise and to refine the questionnaire. They were in agreement that some questions had to be added and some had to be adapted (see chapter 3).

In the Faculty of Health Sciences, it is required that the Ethics Committee, University of the Free State, be informed of the changes made to the questionnaire. This was done in writing (See Annexure A).

1.12 VALIDITY AND RELIABILITY

1.12.1 VALIDITY

Polit, Beck and Hungler (2001:308) indicate that validity is "… the degree to which an instrument measures what it is suppose to be measuring". Therefore validity of the instrument, namely the questionnaire, is determined by the extent to which it actually reflects the abstract construct being examined (Burns & Grove, 2005:399).

Content validity of an instrument/questionnaire is of utmost importance as the questionnaire should have "… an appropriate sample of items for the construct being measured" (Polit & Beck, 2004:423). Burns and Grove (2005:377) indicated that content validity "… examines the extent to which the method of measurement includes all the major elements relevant to the construct being measured".

Validity was ensured by conducting an extensive literature search before the questionnaire was compiled (Burns & Grove, 2005:400). The questionnaire was scrutinized by two domain experts in the field of nursing research, and an expert in the field of infection control to ensure content validity. The full description of how validity was ensured is described in chapter 3.

1.12.2 RELIABILITY

Burns and Grove (2005:395) define reliability in the following manner: "The reliability of a measure denotes the consistency of measures obtained in the use of a particular instrument and is an indication of the extent of random error in the measurement method". Amongst others, a pilot study was done to increase reliability as this assisted in refining the data collection instrument (Refer to chapter 3).

Reliability was further insured by the training of all field workers, conducted on the same day, using the technique to be used during the interview of the major study. The training ensured correct recording of information during the interviews.

1.13 DATA COLLECTION

Data collection denotes gathering of information needed to address the research problem. It is the process of selecting subjects and gathering data from these subjects as defined by Polit and Beck (2004:263). As soon as permission was granted by the Ethics Committee, Faculty of Health Sciences, University of the Free State, permission to conduct the study was obtained from the Acting Head of the Department of Health. After the above mentioned approvals, copies of the approved letters were sent to the Heads of Clinical Support of the regional hospitals or Chief Executive Officers (CEOs) in order to get their permission to conduct the study.

Existing information was used to identify and track respondents who were exposed to NSIs during January 2006 to June 2007 (See Table 1.1) as indicated in the different OHCs' IOD registers of the Free State Province public health sector regional hospitals. The researcher (in Bloemfontein) and trained OHNPs (at the different OHCs outside of Bloemfontein) made individual appointments with the respondents to secure a suitable time and venue for them to be interviewed in privacy, where the information was recorded. The researcher and the OHNPs adhered to the code of ethics as stated in the study, to obtain permission from each respondent prior to data collection and explained to each respondent the aim of the study. The detailed data collection plan is described in chapter 3.

1.14 DATA ANALYSIS

A staff member of the Biostatistics Department at the University of the Free State statistically processed the data. Descriptive statistics, namely frequencies and percentages for categorical data, medians and percentiles for continuous data were

calculated for all health care workers (HCWs) as well as per health care worker (HCW) category. The HCWs categories were compared by means of 95% confidence intervals or the Kruskal Wallis test for cases where small numbers occurred. Two way tables were calculated for HCWs category and other relevant variables.

1.15 ETHICAL ISSUES

According to Polit and Beck (2004:717) "… ethics is a system of moral values that is concerned with the degree with which research procedures adhere to professional, legal and social obligations to the study participants". In addition to this, Burns and Grove (2005:735) refer to the respect for persons, beneficence, and justice relevant to conducting the research. Some of the issues that were addressed included the following:

1.15.1 PERMISSION TO CONDUCT THE STUDY

- Approval of the research proposal was obtained from the Ethics Committee, Faculty of Health Sciences, University of the Free State (Annexure A);
- Approval for conducting the study in the Free State Province Department of Health (DoH) public health sector regional hospitals was obtained from the Acting Head of the Department of Health (Annexure B), and
- The Heads of Clinical Support of each hospital included in the study, were sent signed approval copies of the letters, allowing the researcher to conduct the study.

1.15.2 INFORMED CONSENT

- Prior to data collection verbal informed consent was obtained from the respondents and the entire procedure had been explained to them, and
- Partial confidentiality of the respondents was maintained. No names were made known or written in the questionnaires. Codes were used in data analysis and results;

1.15.3 PARTICIPATION

- Participation was voluntary and respondents were given freedom to withdraw from the study anytime they desired, and
- Respondents were informed that they may after the final report; request a copy of the outcome of the research.

1.15.4 PROCEDURE AFTER COMPLETION OF THE STUDY

The following procedures will be followed after completion of the study:

- Make recommendations to the Free State Province Department of Health (DoH) public health sector regarding prevention and management of NSIs; and
- An article will be published in an accredited journal after being peer reviewed and accepted by the specific journal.

1.16 VALUE OF THE STUDY

The study outcome will assist the Free State Province Department of Health (DoH) public health sector with evidence based research results and recommendations to improve the policies, procedures and management on NSIs and to comply with the National Policy Guideline on Management of Occupational Exposure to HIV.

1.17 OUTLINE OF THE STUDY

The research study will be presented as outlined below:

- Chapter 1: Orientation to the study;
- Chapter 2: Literature review;
- Chapter 3: Research methodology;
- Chapter 4: Discussion of results and literature support, and
- Chapter 5: Conclusions, limitations and recommendations.

1.18 CONCLUSION

In this chapter the researcher orientated the reader(s) regarding the methodology that was followed to reach the stated aim and objectives of this study. Health care workers (HCWs) during the course of their work are exposed to contaminated needles with patients' blood and or body fluids and these can transmit blood borne infections. Thus, the occurrences of the needle stick injury (NSI) amongst HCWs, may pose a problem that requires to be investigated. The quantitative research methodology will assist the researcher to conduct a study that will explore the reasons that contribute to the occurrences of NSIs. The study results will enable the researcher to come up with evidence based recommendations to the Free State Province Department of Health (DoH) public health sector regarding prevention and management of NSIs. In chapter two an in-depth literature discussion of the concepts will follow.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

In the previous chapter the orientation to the study was discussed. This chapter will review the literature on needle stick injuries (NSIs). In the following sections needle stick injury (NSI) will be defined, and followed by a discussion of the determinants of needle stick injuries (NSIs). Then the risk of occupational exposure to transmission of infections via needle stick injuries (NSIs), the types of infections or Blood Borne Pathogens (BBPs) that health care workers (HCWs) are exposed to through needle stick injuries (NSIs), and the contributing factors to needle stick injuries (NSIs) will be indicated. The prevalence and incidence of NSIs and BBPs, categories of HCWs at risk of NSIs and BBPs, prevention of NSIs and BBPs, and the Standard Precautions (SPs) and Universal Precautions (UPs) against NSIs and BBPs will be considered. Finally the immediate action post exposure to NSIs and BBPs, policies, procedures and guidelines on management of exposure to NSIs and BBPs, legislation, and the financial impact of NSIs will be addressed.

2.2 DEFINITION OF A NEEDLE STICK INJURY (NSI)

Millar (2005:0nline) says that a needle stick injury is "… an injury sustained by an individual due to a potentially contaminated needle point". The Centers for Disease Control and Prevention (CDC) is more specific as they define a NSI as: "A penetrating stab wound from a needle (or other sharp object) that may result in exposure to blood or other body fluid infections" (CDC, 2007:Online).

The Canadian Centre for Occupational Health and Safety (2005:Online) specifies the concept of infection and defines NSIs as "… wounds caused by needles that accidentally puncture the skin and transmit infectious diseases, especially blood-borne viruses, namely HIV, hepatitis B, and hepatitis C". Millar (2005:0nline), CDC (CDC, 2007:Online) and the Canadian Centre for Occupational Health and Safety (2005:Online) all show concern regarding the risk of exposure of HCWs to infectious

diseases. This research therefore focuses on the investigation of reported needle stick injuries (NSIs) amongst health care workers (HCWs), with regard to the transmission of blood borne pathogens (BBP) such as; the human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) through NSIs. In this study a needle stick injury (NSI) is defined as any injury, puncture of the skin or laceration by a used needle which could be superficial or deeply penetrating. The injury could either be self inflicted and/or inflicted by another health care worker (HCW) or an injury may be caused by a needle wrongly disposed of. In this study there was no restriction to the determinants of needle stick injuries (NSIs).

2.3 DETERMINANTS OF NEEDLE STICK INJURIES (NSIs)

According to Wilburn (2007:9) and Wilburn and Eijkemans (2007:35) the determinants of NSIs include (quoted in full):

- "Overuse of injections and unnecessary sharps;
- Lack of supplies: disposable syringes, safer needles, devices, and sharps disposal containers;
- Lack of access to and failure to use sharps disposal containers immediately after injection;
- Inadequate or short staffing;
- Recapping of needles after use;
- Lack of engineering controls such as safer needle devices;
- Passing instruments from hand to hand in the operating theatre, and
- Lack of awareness of hazards and lack of training".

The researcher is a qualified occupational health nurse practitioner (OHNP) and is knowledgeable of the hospital procedures, and as a result she is familiar with the determinants mentioned above.

Some of those determinants of NSIs are unavoidable, for example passing instruments to another HCW in the operating theatre and overuse of injections during administration

of medications intramuscularly or intravenously. On the other hand practices such as not recapping of needles after use, lack of training on hazard awareness and lack of access to sharps disposal containers and failure to discard needles into the sharps disposal containers immediately after use can be avoided. The greatest risks of the determinants of needle stick injuries (NSIs) could be for example staff shortage, the use of unsafe needles, as well as shortage of or unavailability of sharps disposal containers. Under these conditions HCWs will remain at risk of occupational exposure to needle stick injuries (NSIs) and transmission of infections.

2.4 THE RISK OF OCCUPATIONAL EXPOSURE TO TRANSMISSION OF BLOOD BORNE INFECTIONS VIA NEEDLE STICK INJURIES (NSIs)

2.4.1 DEFINITION OF OCCUPATIONAL EXPOSURE

The American Nurses Association (ANA) defines occupational exposure to transmission of blood borne infections as: “An incident which occurs during the course of a person’s employment and involves contact with blood or other body substances”. Such exposures may put the person at risk of acquiring blood borne infections (Aiken, Clarke & Sloane, 2002:187-194). An occupational exposure that places health care workers at risk of hepatitis B virus (HBV), hepatitis C virus (HCV), or human immunodeficiency virus (HIV) infection is defined “… as a percutaneous injury (for example, a needle stick injury or a cut with a sharp object) or contact of mucous membrane or non-intact skin (for example, exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious” (CDC, 2001: Online).

What is important in these definitions are that they indicate the conditions which should be sustained in the HCWs employment to prevent NSIs. The focus should be on reducing the risk of exposure to and transmission of blood borne infections. Especially the human immunodeficiency virus (HIV) and the acquired immunodeficiency syndrome (AIDS) epidemic is a major health risk factor in a number of countries, for example the United States (US) and South Africa (SA) (WHO & ILO 2005:50).

2.5 THE TYPES OF INFECTIONS AND BLOOD BORNE PATHOGENS (BBPs) THAT HEALTH CARE WORKERS (HCWs) CAN ACQUIRE THROUGH NEEDLE STICK INJURIES (NSIs)

Nyantumbu and Geyer (2004:3) indicated that health care workers (HCWs) are exposed to infectious blood and other body fluids in the course of their work. Consequently they are at risk of the occupational exposure and transmission of viruses including the hepatitis B virus (HBV) hepatitis C virus (HCV) and human immunodeficiency virus (HIV). Calfee (2006:6) reported that HCWs are at risk of occupational acquisition of HIV and other blood borne pathogens (BBPs), such as HBV and HBC when there is exposure to potentially infectious material via a route that can lead to viral transmission. Potentially infectious materials include; blood, any visible bloody body fluid, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid and amniotic fluid, as well as unfixed tissue.

2.5.1 RISK(S) OF THE OCCUPATIONAL TRANSMISSION OF HEPATITIS B VIRUS (HBV)

Hepatitis B virus (HBV) infection is a well recognized occupational risk for HCWs. 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 (Wilburn & Eijkemans, 2004:451-452). Studies have shown that health care workers (HCWs) get NSIs by needles contaminated with blood containing HBV, as documented in the CDC, (CDC, 2001:Online). The risk of developing clinical hepatitis if the blood is both hepatitis B surface antigen (HBsAg) negative and HBeAg-positive is 22%-31%. The risk of developing serologic evidence of HBV infection is 37%-62%. In addition De Villiers, Nel, and Prinsloo (2007:14) indicate that the risk of contracting HBV infection due to NSIs is 100 times higher than that of contracting HIV. Literature further shows that the risk of developing clinical hepatitis B infection from a needle contaminated with HBsAg-positive or, HBeAg-negative blood is 1%-6%, and the risk of developing serologic evidence of HBV infection is, 23%-37% (De Villiers, Nel, & Prinsloo, 2007:14). McGaw, Peters and Holton *(*2000:562-563) have raised concerns about HCW who are

e-antigen-positive carriers of the hepatitis B virus (HBV). In cases of NSIs, the risk of transmission of HBV has been estimated to be 60 times greater if the carrier is positive for hepatitis B e-antigen than if the carrier does not have the e-antigen. In some areas of the world, over 80% of HCWs have not been immunized against hepatitis B despite its 95% efficacy rate (Prüss-Üstün, Rapiti & Hutin, 2003:213-222).

2.5.2 RISK FOR OCCUPATIONAL TRANSMISSION OF HEPATITIS C VIRUS (HCV)

The average incidence of anti-HCV seroconversion after accidental percutaneous exposure to a hepatitis C virus (HCV) positive source is 1.8% (CDC, 2004: Online). A report on hepatitis C for blood-filled hollow bore needles from Exposure Prevention Information Network *(*EPINet, 2003:4), revealed a seroconversion rate of 0.85%. Transmission rarely occurs from mucous membrane exposure to blood and no transmission in HCWs has been documented from intact or non-intact skin exposure to blood. Symptoms of HCV often do not emerge immediately after sustaining needle stick injury (NSI). The CDC research indicates that it may take years before HCV disease develops in the individual. Therefore the disease may be undiagnosed for 10-20 years or more. As many as 85% of those infected with HCV acquired through NSI, develop chronic liver infection and are at risk of cirrhosis of the liver and liver cancer; possibly requiring a liver transplant (CDC, 2004:Online).

2.5.3 RISK OF OCCUPATIONAL TRANSMISSION OF HUMAN IMMUNO-DEFICIENCY VIRUS (HIV)

One major risk of blood borne infections due to NSIs is the exposure to human immunodeficiency virus (HIV) positive infective blood (Marais & Cotton, 2003:382-283). The study confirmed this concern, as at least half of the junior doctors at the Tygerberg Children's Hospital who had a NSI, were exposed to human immunodeficiency virus (HIV) positive infected blood. The NSIs occurred either while drawing blood or disposing of the needles. Reasons given for this were exhaustion, inexperience and working under difficult circumstances (Marais & Cotton, 2003:382-283). The risk of developing HIV due to needle stick injury (NSI) however is not great; for instance Beltrami,

Williams, Shapiro and Chamberland *(*2000:385-407) indicate that there is an estimated risk of HIV transmission after a percutaneous exposure to HIV-infected blood of approximately 0.3%. Steyn (2005:14) also confirms that the risk of HIV transmission is 0.3% after parenteral exposure, as compared to 0.09% after mucosal exposure. However, Prüss-Üstün, Rapiti, and Hutin (2005:482-490) reported HIV transmission chances of 4.4% from these percutaneous injuries.

The Health Protection Agency (HPA) in the United Kingdom (UK) reported that there have been five documented cases of HIV infection after occupational exposure in the health care setting, the last being in 1993 (Noble & Spink, 2008:Online). Other than HBV, HCV and HIV as discussed above, there are other infections or blood-borne pathogens that HCWs can acquire through NSIs as indicated in Table 2.1 below (CDC, 2007:Online).

Table 2.1 Types of infections or blood borne pathogens (BBPs) that health care workers (HCWs) can acquire through sharp- or needle stick injuries (NSIs) during patient care (PC) and/or laboratory autopsy (LA)

INFECTION	PC	LA	INFECTION	PC	LA
Blastomycosis		⌖	Herpes (CDC does not indicate the type)	⌖	
Cryptococosis		⌖	Leptospirosis		⌖
Diphtheria		⌖	Malaria	⌖	
Ebola		⌖	M. Tuberculosis	⌖	⌖
Gonorrhoea		⌖	Rocky Mountain spotted fever		⌖
Hepatitis B	⌖	⌖	Scrub typhus		⌖
Hepatitis C	⌖	⌖	Streptococcal pyogene		⌖
HIV	⌖	⌖	Syphilis		⌖
Toxoplasmosis		⌖			

(Reproduced from CDC, 2007:Online).

Table 2.1 above has depicted infections that can be acquired through NSIs during patient care (PC) and/or laboratory autopsies (LA). It can be seen from the above mentioned table that several infections can be acquired both during PC and LA, for example M. tuberculosis, HBV, HCV and HIV. However some infections are acquired during either PC only (herpes, malaria) or LA only (diphtheria, toxoplasmosis syphilis).

The Canadian Centre for Occupational Health and Safety (2005:Online) also stated that NSIs have transmitted many other diseases involving viruses, bacteria, fungi, and other microorganisms to HCWs. Many of these diseases were transmitted in rare, isolated events. They still demonstrate, however, that needle stick injuries can have serious consequences. The American Nurses Association (ANA) (Wilburn, 2001:90) indicated that while caring for patients every day, HCWs are at risk of exposure to BBP potentially resulting in infections. These infections, while preventable, are often accepted as being part of the job. The ANA urged immediate and ongoing research looking at factors contributing to NSIs.

2.6 THE CONTRIBUTING FACTORS TO NEEDLE STICK INJURIES (NSIs)

The factors contributing to NSIs (CDC, 2004) include:

- Device type and design of needle;
- Work practices; and
- Work organizational factors.

2.6.1 DEVICES TYPE AND DESIGN OF NEEDLES AND SCALPEL BLADES

The United States National Surveillance System (NaSH) for health care workers (HCWs) identified six device types that contribute to the majority of NSIs and other sharps related injuries (CDC, 2004, Online) are:

- Hypodermic needles (32%);
- Suture needles (19%);

- Winged steel needles (butterfly) (12%);
- Scalpel blades (7%);
- Phlebotomy needles (3%), and
- IV catheter stylets (6%).

The National Institute of Occupational Safety and Health (NIOSH) state that the design of a device can increase the risk of NSI. These are some of the device designs contributing to NSIs (NIOSH, 2004:Online):

- Devices with hollow-bore needles for example injecting needles;
- Needle devices that need to be taken apart or manipulated by the health care worker such as blood-drawing devices that need to be detached after use, for example the venoject needle;
- Syringes that retain a needle after use for example injection syringes, and
- Needles that are attached to tubing such as butterflies that can be difficult to place in sharps disposal containers.

2.6.2 WORK PRACTICES

According to NIOSH and CDC (2004:Online) work practices that are indicated in Table 2.2 below pose a danger to HCWs as they contribute to NSIs. Wilburn and Eijkemans (2004:451-452) mentioned that the two most common work practices that cause NSIs are two handed recapping and the unsafe collection and disposal of sharps and medical waste.

The two studies conducted by NIOSH and CDC (2004:Online) reflect the percentage differences on work practices contributing to NSIs (Table 2.2 below). There was only a difference of 1% noted on the following practices between the NIOSH and the CDC studies: manipulating needle 27% and 26%; recapping 5% and 6%; cleaning up 11% and 10%. Difference of more than 1% was also noted on the following work practices between these two studies: disposal which was 27% and 22%; cannulation 8% and 6%; collision with other HCWs 10% and 8% and other work practices 9% and 4% (CDC, 2004:Online).

Some of the mentioned work practices could not be compared as data was not collected either in the NIOSH study (for example access drip line and transfer/process specimen) or in the CDC's study (for example passing device after use). There was a four year difference between the two studies but the results were almost the same in some work practices. This clearly indicates that work practices are factors contributing to NSIs amongst HCWs in their work organizations.

Health care workers (HCWs) who are e-antigen-positive carriers of hepatitis B virus (HBV) performing "exposure-prone" work practices, have become a significant focus of concern (McGaw, Peters & Holton, 2000: 562-563). Uncertainties regarding the hepatitis B status of HCWs should be established for HCWs who are hepatitis B e-antigen-positive. Given the potentially greater risk of disease transmission to patients and the potential career implications for those infected in the case of a NSIs, work practices that are risky for such HCWs and their patients should be limited by the work institution.

Table 2.2: Comparison of work practices statistics between the National Institute of Occupational Safety and Health (NIOSH) and the Center for Disease Control and Prevention (CDC) studies

Work practices	NIOSH study	CDC study
Manipulating needle	27%	26%
Passing device after use	10%	**Data not collected**
Recapping	5%	6%
Cleaning up	11%	10%
Collision with other HCW	8%	10%
Disposal	22%	27%
Cannulation	8%	6%
Other	9%	4%
Access drip line	**Data not collected**	6%
Transfer/process specimen	**Data not collected**	5%

(CDC, 2004:Online).

2.6.3 WORK ORGANIZATIONAL FACTORS

The work organizational factors that contribute to NSIs include poor staffing and inferior safety circumstances. The HCWs from units with poor staffing and contributing organizational factors reported twice as many NSIs as HCWs on well-staffed units. Thus, inadequate staffing and poor organizational factors are not only unsafe for patients but contributes to medical errors and is also unsafe for HCWs (Aiken, Clarke & Sloane, 2002:Online).

Stevens and Dickson (2007:41-48) similarly indicate that hospitals are organizations in which HIV has double significance, for the HCWs and the organization. In their study (Stevens & Dickson, 2007:41-48) done in South Africa, in a number of hospitals across the country, it was evident that issues around NSIs need to be looked at from an organizational perspective in this era of large numbers of HIV positive patients who need hospital care. Work organizational factors which could contribute to NSIs are amongst others, gaps in HCWs management such as understaffing and unsafe work procedures (Stevens & Dickson, 2007:41-48).

In organizations other than hospitals in which work procedures involve the use of needles, NSIs are a problem. Gershon (2007:24-30) states that it is not hospital settings only that predispose HCWs to NSIs. Non-hospital based healthcare, for example, out-patient clinics, nursing homes, doctors' offices, home-based care centers and public health clinics' work procedures, predispose care givers to blood borne infections due to NSIs. Gershon (2007:24-30), further indicated that in nearly 900,000 registered nurses employed in a wide range of non-hospital settings it was proven in the studies conducted in New York, that one out of ten (1:10) nurses who work in non-hospital settings and not in United State (U.S) hospitals, reports NSIs (Gershon, 2007:24-30).

The above discussed literature on factors contributing to NSIs has given evidence that, the prevalence and incidences of NSIs and exposure of blood borne pathogens (BBPs) will remain a problem to HCWs in all organizations, hospital and non-hospital settings.

2.7 THE PREVALENCE AND INCIDENCE OF BLOOD BORNE PATHOGENS (BBPs) AND NEEDLE STICK INJURIES (NSIs).

The World Health Organization's (WHO) statistics on BBPs showed a high prevalence of disease from occupational exposures of HCWs to contaminated needles. The WHO reported an estimated occupational infection of 90% that occurred in the United States and Europe. In June 2001, 57 confirmed and 137 suspected cases of occupational HIV transmission in the United States had been reported by the CDC. An estimated 36 new cases of HIV, and at least 1,000 cases of seriously transmitted infections, are reported amongst HCWs annually (WHO, 2001:Online and CDC, 2007:Online). The annual number of NSIs and the prevalence of blood borne diseases in the developing world population were estimated to be 40% for the HBV and HBC infections and 2.5% for the HIV infections amongst HCWs (Wilburn & Eijkemans, 2004:451-452). Hassan and Khalid (2001:401-407) conducted a study to provide epidemiological data of NSIs among 282 HCWs in the Eastern Province of Saudi Arabia during 1995 to 1997. The results revealed that 50% of injuries occurred in the first 3 years of employment. HCWs in medical and surgical specialties suffered an equal degree of reported exposure, of 46.8% to 48.5%.

A cross-sectional study was carried out by Hassim (2007:9-12) amongst 136 HCWs in the Accident and Emergency Department of two teaching hospitals in Malaysia. Data was gathered from August to November 2003 to determine the prevalence of cases and episodes of NSIs. The study assessed the HCWs' level of knowledge of blood borne diseases, the risk perception on the practice of universal precautions and the factors contributing to NSIs. The prevalence of NSIs amongst the HCWs were found to be 31.6% (n = 43) and 52.9% (n = 87) respectively.

Prüss-Üstün, Rapiti and Hutin (2003:213-222) conducted a study on global burden of disease from sharp injuries on 35,702,000 health care workers (HCWs) of different categories. This study was done in 14 different geographical regions worldwide (developed and developing). They found that globally more than 35.7 million HCWs face the risk of sustaining at least one percutaneous needle stick injury (NSIs) with contaminated sharp objects every year. These HCWs are amongst others exposed to HBV, HCV and HIV. In developing countries, their study has shown the prevalence of HCV and HBV infection varied between 40%-65%, whilst in developed countries HCV infection varied between 8%-65% and HBV infection remained under 10%, largely because of immunization and post exposure prophylaxis (PEP).

According to the Global AIDS Epidemic Update (2005:Online) Southern Africa (S.A.) remains the worst affected sub-region in the world with HIV. An estimated 5.3 million people were living with HIV in South Africa (SA) at the end of 2003; 2.9 million of them are women. South Africa (SA) has the highest incidence of HIV and AIDS amongst pregnant women of which 41% test HIV positive (SA National Department of Health, 2006:Online). The Free State Department of Health reports an alarming increase of HIV infections amongst patients. The reported statistics reflected an increase of 14.9% for the years 1999–2002 (Chapman, 2004:4). This was also confirmed by Shai-Mhatu (2006:94-139) (Department of Health Free State Province) during a “Comprehensive Roll out Plan” launch in 2007, on ARV in the Free State Province. The known statistics as indicated by the Department of Health Free State public sector for HIV patients, during the period October 2005 to 31 December 2005, was 11 063.

HCWs remain at risk of acquiring blood borne infections should they sustain a NSI. In terms of the World Health Organization (WHO) Stage 4 AIDS defining illness criteria, the Free State Province had 31,111 HIV positive patients in 2002 with an annual increase of 28,290 patients who needed Anti-retroviral therapy (ART). However, by the end of December 2005, only 3,855 patients were on treatment according to Free State Pharmaceutical Services (Steyn, Van Rensburg & Engelbrecht, 2006:94-139). These statistics indicate that there are high numbers of HIV positive patients who are not on

treatment. Therefore, the risk of exposure to BBPs due to NSIs amongst HCWs will remain a problem according to the literature. The researcher identified this problem while performing a walk through survey in all the 31 Free State Province Department of Health (DoH) public health sector hospitals. The high number of NSIs amongst HCWs was also noted on the monthly statistics (unpublished) sent to the Provincial Occupational Health Unit (POHU) where the researcher is appointed. Health care settings where amongst others, unsafe needles are still in use, poses a threat to different categories of HCWs while they are caring for HIV positive patients.

2.8 CATEGORIES OF HEALTH CARE WORKERS (HCWs) AT RISK OF BLOOD BORNE PATHOGENS (BBPs) AND NEEDLE STICK INJURIES (NSIs)

All HCWs who handle or use needles in the course of their work, professionals (nurses, doctors) and non-professionals (cleaners and waste handlers) are at risk of occupational exposure to BBPs and NSIs. Several studies that describe the categories of HCWs at risk of NSIs and BBPs were identified. Millar *(*2005:Online) stated that approximately 75% of health care workers (HCWs) are at risk of needle stick injuries (NSIs) in their work places. These incidences of accidental needle stick injuries (NSIs) and sharps injuries, coupled with potentially fatal consequences (acquiring blood borne infections) are a cause of serious concern to all categories of health care workers.

A study of 102 interns was carried out over two months at the end of 1998 in Johannesburg and Soweto hospitals (Karstaedt & Pantanowitz, 2001:57-61). A high risk of exposure to NSIs was reported, namely 83% of which 43% were from HIV positive sources. Sixty nine percent (69%) of the percutaneous injuries occurred with hollow bore needles; phlebotomy and catheterization accounted for about 60% of these. According to Karstaedt and Pantanowitz (2001:57-61), the expectation, using a seroconversion of 1 in 300, was that one young doctor would become infected every seven or eight years.

Prüss-Üstün *et al*. (2003:213) confirmed that HCWs at risk of NSIs include frontline patient care providers such as nurses, doctors, phlebotomists, and cleaners. The researchers concluded that nurses experience the majority of occupational injuries due to NSIs in the world. This includes half of the exposures that occur in the US and 70% of exposures occurring in Canada (Prüss-Üstün et al., 2003:213).

Hiransuthikul, Tanthitippong and Jiamjarasrangsi (2006:140), have undertaken studies on categories of HCWs at risk of BBPs and NSIs to determine the incidence and related factors of blood and body fluid exposure (BBFE) in King Chulalongkorn Memorial Hospital, Bangkok, Thailand. Nurses reported the greatest number of NSIs, followed by doctors and cleaners. In addition Hiransuthikul *et al*. (2006:149), indicate that the annual incidence rate of BBFE was 31.9% (by person) and 45.5 exposures per 100 persons (by event). The highest category of HCWs at risk of BBPs and NSIs was observed amongst graduated nurses as well as cleaners.

Similarly Green-McKenzie and Shofer (2007:5-9) supported Hiransuthikul *et al*. (2006:140) in their study done to determine the duration of time on shift before exposure to BBPs in cleaners, nurses, and technicians occur and it was found that the: cleaners sustained exposure of 9.4% which was the highest in all HCWs. Amongst nurses the exposure rate was 7.9% and followed by the phlebotomists with the exposure rate of 3%. The study concluded that cleaners sustained a higher rate of accidental BBPs than did nursing staff and technicians.

While the prevalence of occupational exposure to BBPs and NSIs is escalating amongst HCWs, Tetali and Choudhury (2006:35-40) supported other researchers in claiming that HCWs are at high risk of sustaining NSIs during the course of their normal work. Tetali and Choudhury (2006:35-40) conducted a survey on HCWs in three tertiary care hospitals in Kerala, between August 20th and October 30th, 2004. Overall, 74.5% of the respondents had been exposed at least once in the previous 12 months. Surgeons were exposed to NSI most frequently, at a rate of 68%. A high percentage of HCWs (85%)

were concerned about acquiring blood borne infections (Tetali & Choudhury, 2006:35-40).

According to study results from Makary, Al-Attar and Holzmueller (2007:2693-2699) it is indicated that doctors are at risk of NSIs. The study conducted involved 699 surgeons in training at 17 medical centres. The study was also concerned about injuries which involved "high-risk" patients, (which according to researchers are patients with HIV, HBV, HCV infection or injection-drug users). The overall response rate was 95%. Eighty three percent had had a NSI during training. By their final year of training, 99% had had a NSI with 53% exposure to infected blood.

In another study of De Villiers, Nel and Prinsloo (2007:14), among 441 junior doctors at the University of the Free State, Bloemfontein, it was found that 91% had reported NSI in the previous 12 months; 55% of these injuries were from patients who were HIV-positive and 4.3% from known HBV-positive patients. The use of unsafe needles by the hospitals where these junior doctors were practicing shows the extent of danger of exposure to BBPs, which is an everyday reality for HCWs as indicated by De Villiers *et al.* (2007:14) The frequency of serological testing for doctors immediately after exposure was 65.3% for HIV, 21.7% for HBV and 8.2% for HCV. There was no seroconversion to HIV and HCV reported, whilst (two) seroconversions to HBV was reported.

2.9 PREVENTION OF NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs)

The researcher explored the literature on prevention of needle stick injuries (NSIs) and infection with blood borne pathogens (BBPs). Exposure to NSIs and BBPs is one of the most deadly hazards. Yet nurses, doctors and cleaners face the exposure to NSIs and BBPs on a daily basis. Furthermore according to CDC (2007:Online) needle stick injuries is one of the most preventable dangers that HCW face.

With all the concerns and risks of HCWs exposure to blood borne infection due to NSIs as discussed above, over 80% of NSIs can be prevented with the use of safe needle

devices, which, in conjunction with worker education and work practice controls, can reduce injuries by over 90% (CDC, 2007:Online). The International Labour Organization and World Health Organization joined forces and developed strategies to assist health care services to provide their workers with safe, healthy and decent working environments. These preventative strategies are aimed at providing the most effective way of reducing occupational exposure to HIV and AIDS and other BBPs and to improve the delivery of health care to patients (WHO & ILO, 2005:50). In addition there is an international exposure prevention information network (EPINET) used worldwide for tracking occupational exposures to sharps. Data is in then used for improving the prevention strategies against NSIs and BBPs (Jagger, 2007:4).

2.9.1 EXPOSURE PREVENTION INFORMATION NETWORK (EPINet)

2.9.1.1 EPINet

EPINet is the third edition of the Exposure Prevention Information Network. It is an international approved computer program that tracks sharp-object injuries, blood and body fluid exposures, and post exposure follow up (Jagger & Parker, 2001:1-65). EPINet was developed by Janine Jagger. The program is recognized in South Africa and has already been used to capture data on NSIs.

2.9.1.2 Benefits of Exposure Prevention Information Network (EPINet) in needle stick injuries (NSIs)

EPINet provides reports that include:

- A facility's first recorded incidents of sharp-object injuries and blood and body fluid exposures;
- Pre-programmed report forms;
- Data entry screens;
- Report formats, and
- Graphs.

Exposure Prevention Information Network (EPINet) is used to enter data after which reports and graphs can be viewed and printed. The network runs the reports of customized subsets of the institutional data. Once a user accesses a standardized surveillance system such as EPINet, it is easy to compare own data with that of other health care facilities that use the same program. In the event of a sharp-object injury or where there is blood and body fluid exposure, the appropriate EPINet reporting form is completed by the injured/exposed worker, usually with the assistance of personnel from the occupational safety or employee health department. Information on the report form is entered through pre-programmed data entry screens into the EPINet database in a process that usually takes one to two minutes per incident to complete. In all versions of EPINet, each injury or exposure is recorded as one incident in the database. Records are aggregated to produce summary reports. Reports can be generated for exposures occurring within any range of dates you specify. Reports can also be created for exposures associated with a specific department, job category, location, procedure, or device, among other categories. These options are selected from drop-down menus and require no programming expertise. EPINet reports provide the information needed to identify injury and exposure patterns in the facility. Once the problem areas are identified, appropriate corrective actions are determined through on-going monitoring of the results (Jagger & Parker, 2001:3).

Similarly the Vietnam region identified prevention projects for NSIs and BBPs in 2002 as reported in a World Health Report (Wilburn, 2004:Online). The purpose of the project was the protection of health care workers. The project was done in collaboration with the Ministry of Health, the Occupational Health Institute and the National Nursing Association. Wilburn (2004:Online) stated that the key preventative elements of the project included:

- A planning meeting;
- An initial assessment;
- The set up of a surveillance reporting system;
- An exposure management programme;
- Information, Education and Communication (IEC);

- Provision of equipment and supplies;
- A supportive supervision, and
- Monitoring tool (Wilburn, 2004: online).

Literature studies have proven that the different strategies implemented in prevention of NSIs and BBPs have positive results.

2.9.2 LITERATURE ON PREVENTION OF NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs).

Prevention of a NSI is an important step in preventing the transmission of blood-borne infections to HCWs. The WHO has developed an injection safety toolbox for prevention of needle-stick injuries (WHO, 2003:Online). This toolkit for prevention of NSI was tested in South Africa (S.A) by the National Institute for Occupational Health (NIOH). The NIOH has undertaken a study done by Nyantumbu and Geyer (2004:27) using the toolkit in Pretoria hospitals. The study researched statistics on infection control, anonymous reporting of needle-stick injuries (NSIs) and observations. The hospital had a surveillance system for NSIs that captured about 100-150 injuries each year. Six questions were used to measure needle-stick injuries. The outcome showed that many NSIs were not reported, that a high proportion did lead to inferior care and most health care workers (HCWs) were not aware of any policy. Observations of work practices led to the observations of unsafe practices that had exposed the injection recipient and the provider to blood borne infections (Nyantumbu & Geyer, 2004:27).

Azar-Cavanagh, Burdt and Green-McKenzie (2007:165-170), conducted a research on HCWs who sustained NSIs to evaluate the effectiveness of the introduction of an Engineered Sharps Injury Prevention Device (ESIPD) with the goal of reducing the percutaneous injury rate in HCWs and Hospital Infection Control. The study outcome after the intervention, showed the decreased significance ($P<.01$- $P<.008$) in the incidence of NSIs. The study therefore gave evidence that the ESIPDs led to a reduction in percutaneous injuries in HCWs, with less HCWs at risk of exposure to BBPs.

The American Nurses Association (ANA) (2007:Online) were concerned about the safety of HCWs and the prevention of exposure to NSIs and BBPs of HCWs which took them years of lobbying. The outcome of the efforts of the ANA was positive because there are now significant laws and regulations implemented that provide nurses with protection against occupational exposure to NSIs. The American government passed the law in favour of prevention of BBPs exposure, namely the OSHA's 1991 blood borne pathogens (BBP) Standard.

According to the CDC (2004:Online) the OSHA BBPs Standard, including the amendments from the federal Needle Stick Safety and Prevention Act, requires health care facilities to implement the following control measures in prevention of BBPs and NSIs:

2.9.2.1 Engineering controls

Engineering controls ensure the following practices:

- Use "safer medical devices, such as sharps with engineered sharps injury protections and needleless systems," and other engineering controls;
- Make safer needles and other sharps with integrated safety features available in syringes, blood collection devices, IV access products, lancets, and blunt suture needles, and
- Use puncture-proof colour coded containers to dispose sharps and needles. Containers must be closed, leak proof, and emptied routinely to prevent overfilling (CDC, 2004:Online).

2.9.2.2 Frontline health care worker involvement and training requirements

These requirements are the following:

- Include the involvement of frontline health care workers (non-managerial employees responsible for direct patient care) in device evaluation and selection, with evidence of this participation documented in the exposure control plan, and

- Provide frontline health care workers with interactive training on the use of safer devices, work practices, and Administrative, Work Practices and Personal Protective Equipment (PPE) from a knowledgeable person. Workers must receive training when hired and at least once a year. Training must be provided during working hours and at no cost to employees. Training records must be maintained for three years (CDC, 2004:Online).

2.9.2.3 Exposure Control Plan (ECP)

The Exposure Control Plan (ECP) prescribes the following:

- Have a hard copy written of the ECP and make it available to employees or their representatives within 15 working days of a request;
- Review and update the ECP annually or more frequently whenever new or modified procedures are adopted or whenever employee positions are revised in such a way that it creates new potential exposures, and
- Inform workers of the location of the ECP and the procedures to follow if an exposure occurs (CDC, 2004:Online).

2.9.2.4 Administrative, work practices and personal protective equipment (PPE)

These practices and equipment prescribe the following procedures:

- Make device purchasing decisions based on the proven safety and efficacy of the product;
- Prohibit work practices of bending, re-capping, or removing needles unless required by a specific medical or dental procedure;
- Clean and decontaminate all work surfaces after contact with blood and other infectious body fluids following CDC guidelines, and
- Provide PPE including gloves, gowns, goggles, masks or face shields. These devices must be in sizes that fit all workers, of good quality and readily available non-latex alternatives must be provided (CDC, 2004:Online).

2.9.2.5 Recordkeeping

Recordkeeping should be done in the following manner:

- Maintain a sharps injury log updated regularly with the details of all needle stick injuries (NSIs), including date, place, situation, and device brand and type (ANA, 2007:10-16).

Wilburn and Eijkemans (2007:10) has also indicated that the prevention of BBPs needs hierarchical controls, as indicated by Joint WHO/ILO (2005:50) guidelines on health services, they are discussed from most effective to least effective and include:

- Elimination of hazards for example, removes sharps and needles and eliminates all unnecessary injections. Jet injectors may substitute syringes and needles;
- Engineering controls for example, such as needles that retract, sheathe or blunt immediately after use;
- Administrative controls such as, policies aimed at limiting exposure to the hazard. Examples include allocation of resources, demonstrating a commitment to health care worker safety, a needle stick prevention committee, an exposure control plan, removing all unsafe devices, and consistent training on the use of safe devices;
- Work practice controls for example, no re-capping, placing sharps containers at eye level and at arm's reach, emptying sharps containers before they're full, and establishing the means for safe handling and disposing of sharps devices before beginning a procedure, and
- Personal Protective Equipment (PPE) for example, barriers and filters between the worker and the hazard. Examples include eye goggles, gloves, masks, and gowns (Wilburn & Eijkemans, 2007:10).

Furthermore Wilburn and Eijkemans (2007:10) in response to changing work practices that puts HCWs at risk of exposure to NSIs, have monitored the efficacy of control measures in hierarchical controls to ensure prevention of NSIs. Findings are discussed in Table 2.3 below:

Table 2.3: The hierarchical efficacy control measures of needle stick injuries (NSIs)

Method of Control	Efficacy of control measure
Elimination of hazard	Needles systems were shown to be 78.7% effective in reducing NSIs over one year in a Canadian study
Engineering controls	Sharps containers reduced injuries by two-thirds (2/3). A review of seven studies of safer needle devices demonstrated a reduction in injuries from 23%-100% with an average of 71%
Administrative controls	Poor safety climate and reduced staffing was associated with a 50% increase in NSIs and near misses
Work practice controls	Elimination of recapping resulted in a two-thirds (2/3) reduction in NSIs
Personal Protective Equipment	Double gloving in the surgical setting reduced puncture of the inner glove

(Wilburn & Eijkemans, 2007:10)

It is evident that prevention of exposure to NSIs and BBPs needs a combination of different strategies as discussed by different authors. The researcher assessed the methods or guidelines that the above mentioned authors (ANA, 2007:Online and Wilburn & Eijkemans, 2007:10) has discussed, and found that there was a link between the devices used (unsafe devices), the work practice (recapping), personal protective equipment not used and lack of training which contributed to NSIs. On the other hand NSIs can be reduced and HCWs exposure to BBPs limited if workplaces comply with standards that are well known by workers. According to Wilburn and Eijkemans (2007:10) hierarchical control has showed positive study outcomes.

Therefore, there should be standard and universal precautionary measures coupled with control measures to prevent and reduce the NSIs amongst HCWs.

HCWs have to be knowledgeable of standard and universal precautionary measures in daily work practice in prevention of blood borne infections. The CDC (2001:Online) has introduced Standard Precautions (SPs) and Universal Precautions (UPs) for protection of HCWs against NSIs and BBPs in health care settings. This is according to consensus among infection control experts of Hospital Infection Control Practices Advisory Committee (HICPAC) (CDC, 2001:Online). In this study the researcher have included some questions on Standard Precautions (SPs) and Universal Precautions (UPs), for data collection in order to assess the level of safety practices amongst HCWs.

2.10 STANDARD PRECAUTIONS (SPs) AND UNIVERSAL PRECAUTIONS (UPs) FOR PROTECTION OF HEALTH CARE WORKERS (HCWs) AGAINST NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs)

2.10.1 DEFINITIONS OF STANDARD PRECAUTIONS (SPs) AND UNIVERSAL PRECAUTIONS (UPs)

The Department of Health, Hong Kong Centre for Health Protection (2005:1) defines standard precautions (SPs) "... as a set of precautionary measures including good hand hygiene practices and use of protective barriers during routine patient care carried out by health care workers (HCWs)". SPs encompass precautions in the handling of blood, all body fluids, secretions and excretions and avoidance of contamination of non-intact skin and mucous membranes.

According to the CDC (2001:Online) SPs are defined "... as a measure to reduce the risk of transmission of microorganisms as both recognized or unrecognized sources of infection in hospitals". SPs apply to blood, all body fluids, secretions and excretions, regardless of whether they contain visible blood.

The United States Department of Labor, Occupational Safety and Health Administration (OSHA) (2003:Online) define SPs as "... a set of standards for limiting occupational

exposure to blood and other potentially infectious materials which could result in transmission of blood borne pathogens and lead to possible disease or death". The standards cover all employees who are reasonably expected to have exposure to blood and body fluids while performing their duties, regardless of the setting.

Siegel, Rhinehart, Jackson, and Chiarello (2007:Online) define Standard Precautions (SPs) "... as standards that apply to the recommended practices of healthcare personnel during patient care".

Universal Precautions (UPs) was originally defined by the CDC (1985:Online), "... as universal precautions applied only to blood and body fluids that have been implicated in the transmission of blood borne infections (semen and vaginal secretions), body fluids with an unknown risk of HIV transmission (amniotic, cerebrospinal, pericardial, peritoneal, pleural and synovial fluids) and to body fluids that are contaminated with blood". However, it did not apply to faeces, nasal secretions, sputum, sweat, urine or vomitus which was later included under the recommendations of Body Substance Isolation (BSI). In the early 1990s, some countries like Australia, adopted a broader definition of UPs and applied it to all blood and body substances which are considered to be potentially infectious.

The WHO (2005:Online) define Universal Precautions (UPs) as "... a simple set of effective practices designed to protect health care workers and patients from infection with a range of pathogens including blood borne viruses". These practices are used when caring for all patients regardless of diagnosis.

Richard, Kenneth, Cherian and Chandy (2000:82-85) also support that HCWs should practice SPs and UPs in prevention of transmission of blood borne infections. Richard *et al*. (2000:82-85) further indicated that all patients blood and body fluids should be assumed to harbour blood-borne pathogens (BBPs), therefore HCWs should take adequate precautions as methods of preventing transmission of blood-borne pathogens (BBPs).

Sridhar, Boopathi, Lodha, and Kabra (2004:617-625) indicated that precautionary measures should be adhered to by HCWs, to prevent infections. In a health care set up, risk of acquiring infections by both patients and health care workers (HCWs) from each other is fairly high. They stated that hospital acquired infections (HAI) are a problem in both developed and developing countries and are an important cause of death. Many different microbes cause HAI in both patients and HCWs; these include various pathogenic bacteria, viruses, parasites, and fungi. Among these HIV, HBV, and HVC are of major significance to HCWs. Therefore standard precautions (SPs) are designed to reduce the risk of transmission of blood borne infections in a health care set up from both recognized and unrecognized sources.

The Department of Health, Hong Kong, Centre for Health Protection (2005:3) and CDC (2004:Online), have specific SPs which they adopted from the United State guidelines on hospital infection control practice (Garner, 1996:53-80) which covers the following precautionary measures:

- **Hand washing**

This precautionary measure should be practiced with every patient attended. The rule is to treat all blood and body fluids; with caution as the HIV status in most cases is unknown. Hands must be washed before and after patient contact and removal of gloves. Hands must be washed with plain soap and water.

- **Protective barriers**

Disposable gloves must be worn when there is a direct contact or possibility of contact with blood, body fluids, mucous membrane and non-intact skin of all patients. Gloves should preferably be changed after patient contact, before administering care to another and whenever they are torn in the case of NSI or other injury. Double gloves have been recommended for many surgical procedures, since they decrease the amount of blood exposed.

2.10.2 SHARPS HANDLING AND MANAGEMENT

2.10.2.1 Definition of Sharps

Chair (2003:1-6) defines “Sharps” as “... any objects capable of inflicting penetrating injury, and includes: needles, pins, fine forceps, scalpel blades, wires, probes, trocars, auto lancets, stitch cutters, scissors, toothpicks, and broken glassware”. Another definition by the Michigan Occupational Safety and Health Administration (MIOSHA) stated that sharps are all syringes and needles, scalpels, and intravenous tubing with needles attached. Also, any item that is sharp enough to penetrate the skin and is contaminated with potentially infectious materials or recombinant DNA, “for example, contaminated capillary tubes, pasteur pipettes, and microscope slides and cover slips is defined as a sharp” (United States, Medical Waste Regulatory Act, of the Michigan Public Health (MWRA), 1978:Online).

Sehulster and Chinn’s (2003:1-43) guidelines on Regulated Medical Wastes have emphasized the proper sharps disposal strategies. It is profitable to ensure that HCWs are trained in appropriate handling and disposal methods. The use of puncture-resistant containers prevents sharps injuries and should be compliant with South Africa’s Regulation for Biological Agents with a biohazard sign Sharps injuries can be prevented by locating sharps disposal containers as close as practical to the point of use and they should not be overfilled. NSI is one of the problems encountered by poor compliance to sharps handling (South Africa, OHASA, 1993:42).

Similarly the Department of Risk Management and Safety (DRMS) established a medical waste management program for Auburn University’s Department of Environmental Management (ADEM) and has a strategy for handling of sharps (CDC, 2002:Online). The Regulation for Biological Agents (South Africa, OHASA, 1993:42) and Gray (2002:1-3) discuss the handling and management of sharps as follow:

- Where sharps are being used when dealing with potentially infectious or infectious materials, with all body fluids and substances, or with chemicals or

drugs, the sharps will be then also regarded as potentially infectious and will be disposed of accordingly;

- All safety procedures must be adhered to during the handling of sharps. Each HCW should have received instructions on the correct handling of sharps before any use of sharps is undertaken;
- Handle sharp objects carefully and always wear gloves;
- Do not cut, bend, break or routinely reinsert used needles into original sheath by hand and contaminated needles are never to be recapped;
- Do not detach used needle from syringe. For needles attached to IV tubing, remove the capped needle from the tubing and discard into approved container;
- Discard sharp objects intact immediately after use into the biohazard marked impervious needle disposal container conveniently placed in all clinical areas, or in the smaller portable container for remote use;
- Personnel should never reach into the needle container;
- Sharps containers must be kept upright, replaced routinely and kept from becoming overfilled;
- All sharp objects are to be kept separated from general waste and general waste receptacles;
- The receptacle into which these sharps are to be placed must be yellow in colour and labelled as “Medical Sharps Waste” or “Infectious Waste” and have a universal biohazard symbol displayed (South Africa, OH&S Act No. 85 of 1993:42). Colour coding differs per countries for example (Gray, 2002:1-3) indicated that the sharps container must be red in colour and display the International Biohazard Symbol or one of the following phrases: Medical Waste; Infectious; Infectious Waste or Bio hazardous;
- Such sharp containers must be puncture resistant, moisture-proof, shatterproof, capable of being sealed and able to withstand heavy handling;
- Never place your hands in a sharps container, or remove any objects from a sharps container;
- When removed from work area, containers will be closed to prevent spillage or protrusions during handling and must be transported in upright position;

- When the containers are 3/4 full, it is the responsibility of the medication nurse to make arrangements for the teamster to take the container to waste designated area;
- Disposal of sharps containers must be made through an approved waste management contractor, and
- Report immediately all NSIs, exposure and accidents involving any used needles or sharps to the Occupational health clinic (OHC) or Infection Control nurse or as indicated in the individual hospital/institution guidelines for post exposure to needle stick injuries (NSIs) and blood borne pathogens (BBPs) (South Africa, OHASA, 1993:42 & Gray, 2002:1-3).

2.11 IMMEDIATE ACTION POST-EXPOSURE TO NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs).

HCWs should immediately post-exposure to NSIs, blood or other body substances do the following according to the recommendations of the CDC (2008:Online):

- Wash the exposed site, cuts or puncture of the skin or intact skin with soap and water;
- Inform the supervisor or an appropriate person to ensure that necessary further action is undertaken, and
- Follow the institution/hospital Post Exposure Prophylaxis (PEP) procedure on exposure to NSIs and/or BBPs.

2.11.1 POST-EXPOSURE PROPHYLAXIS (PEP) AND ANTIRETROVIRAL TREATMENT (ARV)

2.11.1.1 Definition of post-exposure prophylaxis (PEP)

Post-Exposure Prophylaxis (PEP) is the medication that is given to the exposed HCW post NSIs or BBPs for reducing the chance of acquiring blood borne infections (CDC, 2001:Online). Spink (2008:1-7) states that PEP is an antiretroviral (ARV) drug or treatment that is started immediately after someone is exposed to blood and body fluid which could have blood borne infections such as HIV.

The aim of PEP, by administration of ARVs, is to allow HCWs immune system a chance to provide protection against the virus and to prevent him/her from acquiring blood borne infections. To allow for ARV to have an effect on the HCW's body, medication needs to be taken as soon as possible, that is immediately within 2 hours of the exposure and definitely within 72 hours post exposure. Literature indicates (CDC, 2008:Online), that left any longer, the effectiveness of the treatment will be compromised. Once PEP is started it should be continued for a month to be most effective according to the CDC (2008:Online).

2.11.1.2 Definition of Antiretroviral treatment (ARV)

Antiretroviral treatment (ARV) is defined as: "The range of medications prescribed to minimize the effects of HIV infection by keeping the level of virus in the body at as low a level as possible (WHO & ILO, 2005:Online).

On Tuesday, 16 November 1999 the statement of the former South African Minister of Health, Dr ME Tshabalala-Msimang (1999:Online), to the national assembly on HIV and AIDS and related issues, stated that AZT, aside from being registered in South Africa for use with HIV and AIDS patients, is also registered to treat health care workers following needle-stick injuries (NSIs). However, during the period of 1999 South Africa was the only country in the world, that AZT was registered for this purpose, according to Minister of Health, Dr. ME Tshabalala Msimang (1999:Online).

Post-Exposure Prophylaxis (PEP) in most hospitals/institutions consists of two or three different types of antiretroviral (ARV) drugs that are also prescribed as treatment for people with HIV (CDC, 2001:Online). The most common ARVs prescribed for PEP are: Zidovudine (AZT), Lamivudine and Nefinavir. In a case control trial using PEP with Zidovudine (AZT) a reduction in the risk of transmission of HIV infection by 80% was demonstrated (CDC, 2001:Online).

2.12 POLICIES, PROCEDURES AND GUIDELINES ON MANAGEMENT OF EXPOSURE TO NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs)

During a literature search, the researcher found that policies and guidelines or procedures on management of post-exposure to NSIs and BBPs used in different hospitals/institutions internationally and nationally, are in line with the guidelines or recommendations of the Center for Disease Control and Prevention (CDC, 2000:Online). These recommendations have been proved to be effective on Management of exposure to NSIs and BBPs. The following were examples of international and national PEP guidelines:

- The ANA (2007:Online);
- The CDC (2001:Online);
- The CDC (2002:Online);
- US CDC (2003:Online);
- US CDC (2008:Online);
- The United States Public Health Service (2001:Online);
- The Department of Health New South Wales, 2005 Policy Directive (Sepkowitz, 2005: 917-928 & Gerberding, 2005:497-501);
- Division of Nosocomial and Occupational Infections Bureau of Infectious Diseases Laboratory (2002:Online);
- Prevention and Management of Occupational Exposure to BBPs (Calfee 2006:Online);
- The South African National Institute for Occupational Health's (NIOH) guide on Standard Operational Procedure for NSIs (2004:Online);
- The South Africa National Institute of Occupational Health's (NIOH) guidelines for accidental exposure against HIV and BBPs (2004:Online);
- The University of the Free State (Steyn, 2005:1-6), and
- The Free State Department of Health (Oosthuizen, 2008:1-28).

These policies, guidelines or procedures are also in line with:

- Firstly the Recalling the Promotional Framework for Occupational Safety and Health Convention, 2006;
- Secondly, the international instruments in the area of occupational safety and health adopted by the General Conference of the International Labour Organization (ILO), Geneva 2006, and
- Thirdly, the Sixtieth World Health Assembly Agenda item 12.13, May 2007 discussions on workers health and safety (Rantanen, 2007:Online).

South Africa was represented by the National Institute for Occupational Health (NIOH) and the National Department of Health (NDoH) in all the mentioned discussions. These above mentioned meetings and conferences discussed issues of occupational health and safety for workers internationally and nationally. The issues under discussion could affect the health and safety of HCWs while performing their work.

The researcher consulted with the National Department of Health, National Institute for Occupational Health, University of the Free State, consultant for infection control and the Free State Province Directorate for Employee Health and Wellness Programs. The purpose of the consultation was to validate policies, guidelines or protocols on management of exposure to NSIs and BBPs.

2.12.1 SUMMARY ON HOW TO MANAGE EXPOSURE TO NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs)

The following are T

The guidelines for management of exposure to NSIs and BBPs are the following (CDC, 2008:Online):

- Immediately allow the entry wound to bleed freely (1 to 2 minutes) and wash with soap and running water. Disinfect the wound with disinfectant available in your hospitals/institutions;
- Report the incident to your immediate supervisor (for example registered nurse in charge);

- If possible have blood taken from the patient immediately, after obtaining written consent. Arrangements for this may be made with the registrar on call for Internal Medicine (Steyn, 2005:1-6). However, do not waste time you can always go back to the patient to draw blood;
- Should the patient refuse to have blood taken, if the source of contamination is untraceable (unknown needle in rubbish bin), or if there is any suspicion that the patient may be in the window period, the patient must be regarded as HIV positive;
- Babies of HIV positive mothers must always be regarded as sero-positive. At present it is not possible to eliminate HIV infection in a baby with any certainty before the age of 18 months (Steyn, 2008:Conference);
- HCW should be tested immediately and confidentiality for HIV, HBV and HCV infection;
- Get post exposure prophylaxis (PEP) according to CDC (2008:Online) guidelines (Tables 2.4 & 2.5);
- Document the exposure details in full;
- Get confidential follow up, post exposure testing at six weeks, three months and six months and depending at the risk, at one year, and
- Receive monitoring and follow up of PEP (CDC, 2008:Online).

2.12.2 PATIENT INFORMATION

The following information about the patient is required for injury on duty (IOD):

- HIV status (Please note: obtain the patient's written consent before sending blood away for HIV testing);
- Hepatitis B Surface Antigen (HBsAg);
- Hepatitis C (only if source patients are a high risk group for example hemophiliacs), and
- CD4 count (not compulsory) (CDC, 2001:Online).

2.12.3 PROTECTION AGAINST HEPATITIS B INFECTION

The following procedures are to be performed in order to protect the HCW:

- Hepatitis B immunoglobulin (Hebagam®) 0.06 ml/kg must be given as soon as possible after exposure if the immune status is unknown (protection is dramatically reduced after 48 hours);
- It is not always practical to wait for laboratory reports;
- Immunization against hepatitis B should be given immediately, and
- If immunization has been done previously, a booster dose of the vaccine is recommended unless the anti-HBsAg antibody titre is known to be more than 100 mIU/litre (CDC, 2001:Online).

2.12.4 PROTECTION AGAINST HIV INFECTION

The following procedures are recommended as protection against HIV infection:

- The following drugs must be taken as soon as possible (preferably within the first 1 to 2 hours): AZT and 3TC or Combivir®;
- The stat dose is given at either casualty or occupational health clinic;
- Drugs must be commenced within 1 to 2 hours (preferably not later than 8 hours) but are probably still indicated 3 days or even later after exposure (rather late than never);
- A full blood count and a liver function test are recommended after 2 weeks and 4 weeks, only if side effects to therapy are experienced. This must be done as soon as possible (but not later than 7 days);
- The HIV antibody tests are repeated after 6 weeks, 3 months and 6 months (preferably also after 12 months);
- It is the responsibility of the exposed HCWS to make sure that the results of these tests are recorded in the register for needle stick injuries;
- Failure to do so would mean that no claim to compensation could be verified should HCWs contract HIV infection (all results will be regarded as strictly confidential);

- Taking therapy does not necessarily safeguard HCWs from seroconversion, and
- The side effects of the therapy, especially nausea and gastrointestinal discomfort mean that some people cannot tolerate it (Adequate fluids l.5 litres a day must be taken for the entire period if Crixivan® is taken as it can cause renal calculi) (CDC, 2001:Online).

Table 2.4: Post-exposure prophylaxis drugs

Drugs	DOSAGE	FREQUENCY
AZT	200 mg	3x/day
3TC	150 mg	2x/day
Combivir® (AZT 300mg + 3TC 150mg)	1 tablet	2xday (both drugs are recommended unless indicated otherwise
Crixivan®	800 mg	3xday (only in case of very high risk exposure)

(Gibbon, 2005:311)

Table 2.5: Occupational Post-Exposure Prophylaxis (PEP) recommendations

Occupational Post Exposure Prophylaxis (PEP) recommendations			
Exposure	**HIV status of source patient**		
	Unknown	**Positive**	**High Risk**
Skin intact	No PEP	No PEP	No PEP
Mucosal splash or non-intact skin	Consider two drugs	Recommend two (2) drugs	Recommend two (2) drugs
Percutaneous (sharps)	Recommend two (2) drugs	Recommend two (2) drugs	Consider three (3) drugs
Percutaneous (Needle in vessels or deep injury)	Recommend two (2) drugs	Recommend three (3) drugs	Recommend three (3) drugs

(Gibbon, 2005:311)

2.12.5 FOLLOW UP POST-EXPOSURE TO NEEDLE STICK INJURIES (NSIs) AND BLOOD BORNE PATHOGENS (BBPs)

The following is the procedure for follow up of post-exposure to NSIs and BBPs (CDC, 2008:Online):

- The appointment with the HCW should be used to address any ongoing anxiety the exposed person may be experiencing;
- Conduct further counseling and provide advice on managing side effects as appropriate;
- In addition to baseline, testing is needed of the exposed HCW for HIV antibody;
- The exposed HCWs should be retested at 6 weeks and 3 months, and be tested for other blood borne viruses, and
- If antiviral therapy was given, testing for HIV antibody should be continued up to and including a 6 month follow-up following the exposure, as therapy may delay conversion to sero-positive status (CDC, 2008:Online).

2.12.6 COUNSELLING OF THE HEALTH CARE WORKERS (HCWS)

Counseling should include the following information:

- Risk of HIV infection following the occupational exposure;
- Reports of seroconversion following HIV prophylaxis;
- Side effects and adverse reactions associated with HIV prophylaxis;
- Use in pregnancy/breastfeeding of HIV prophylaxis (if appropriate), and
- Current status of knowledge regarding the efficacy of chemoprophylaxis following occupational exposure to HIV.

Counseling should be done each time when taking blood from the HCW.

During the 6 month period following exposure the HCW should be advised to:

- Protect sexual partners by adopting safe sexual practices and use of condoms (Sepkowitz, 2005: 917-928);
- Seek expert medical advice in pregnancy and on breastfeeding;
- Not donate plasma, blood, body tissue, breast milk or sperm, and
- Modify work practices if involved in the performance of exposure prone procedures if HCW develops clinical or serological evidence of HBV.

As mentioned earlier, development of policies, guidelines or protocols that are in use worldwide are as recommended by Center for Disease Control (CDC, 2008:Online), and supported by the World Health Organization (WHO). As a result the researcher did not add or change much of the information on management of exposure to BBPs or NSIs and/or sharps injury, especially because referencing of those institutions will be made. These guidelines are approved as legal documents to those institutions or hospitals. The researcher noticed a difference when comparing the policies, guidelines or protocols of several institutions. They are developed to comply with a particular institution or hospital either financially or according to the institution's structure. For example the hospitals' and universities' guidelines both internationally and nationally differ in the administrative process but conversely, the medications given (ARVs) post exposure are the same as on the recommendation by the CDC (2001:Online). Hospitals and institutions, internationally, nationally and provincially, are enforced by legislations to provide the post exposure prophylaxis (PEP), to all exposed health care workers (HCWs), to ensure their health and safety post exposure to NSIs and BBPs.

2.13 LEGISLATIONS

2.13.1 INTERNATIONAL LEGISLATIONS

Internationally there are several legislations that address the health and safety of HCWs after exposure to NSIs and BBPs. These are, for example, the Occupational Safety and Health Act, 1991 and the blood borne pathogens (BBP) Standard in the United States. The law applies to all employees working in the private sector (for-profit and non-profit institutions) and municipal workers.

Despite these standards, NSIs and exposure of BBPs continues to occur at frightening levels and is still a problem. The American Nurses Association (ANA) raised a concern that both public and private sector workers should be protected and launched a campaign for federal legislation to provide even more protection. The ANA's "Safe Needles Save Lives" campaign ultimately secured passage of the 2000 Needle Stick Safety and Prevention Act. This federal law amended the 1991 blood borne pathogens

(BBPs) Standard to provide stronger protection including additions to the exposure control plan, detailed recording of NSIs, involvement of frontline health care workers in the selection of safety devices, and more details and instruction on engineering controls and safer devices that must be used to prevent exposure to NSIs (ANA, 2002:Online).

The United States Department of Labor (2003:Online), Occupational Safety and Health Administration (OSHA) have added needle stick prevention to its agenda in an attempt to reduce the number of injuries that health care workers get from needles. The legislation provides for the following:

- An exposure control plan where employers develop a written plan to identify and select needleless systems or sharps systems with safety features;
- A sharps injury log where employers would be required to keep a log containing detailed information about sharps injuries; and
- Training of health care workers on the use of needleless technologies and systems.

Since the introduction of OSHA, needle stick injuries began to decrease from an estimated one million exposures per year in 1996 to 385,000 per year in 2000 (United States Department of Labor, 2003:Online). Reasons for the success in decreasing needle stick injuries and sharps injuries may be attributed to the elimination of needle recapping and the use of safer needle devices, sharps collection boxes, gloves and personal protective gear, and universal precautions.

In May 1999, the Health Care Worker Needle Stick Prevention Act was introduced in the United State (US) Senate House. The needle stick prevention legislation was passed in the US Congress on October 26, 2000. The Senate voted to pass Human Resource 5178/S 3067, the Needle stick Safety and Prevention Act.

2.13.2 SOUTH AFRICAN LEGISLATION

In South Africa there is no needle stick prevention legislation that enforces employers to protect the health care workers (HCWs) against exposure to NSIs and BBPs. However,

there are different legislations which gives guidance with regard to protection of health and safety of health care workers (HCWs), for example, the National Health Act, No. 61 of 2003 and the Occupational Health and Safety Act, No 85 of 1993. There is also legislation that guides the process in case of Injury on Duty (IOD), namely, The Compensation for Occupational Injuries and Diseases Act, (COIDA) No 130 of 1993.

2.13.2.1 National Health Act, No. 61 of 2003

The National Health Act, No. 61 of 2003, Chapter 2 addresses the following:

2.13.2.1.1 Rights of health care personnel (Section 20, sub section 1, 2 & 3)

"Health care personnel may not be unfairly discriminated against on account of their health status. Despite subsection (1) but subject to any applicable law, the head of the health establishment concerned may in accordance with any guidelines determined by the Minister impose conditions on the service that may be rendered by a health care provider or health worker on the basis of his or her health status. Subject to any applicable law, every health establishment must implement measures to minimize *(a)* injury or damage to the person and property of health care personnel working at that establishment; and *(b) disease transmissio*n" (South Africa. National Health Act, 2003:28).

2.13.2.1.2 Provincial health services and general functions of provincial departments

Chapter four (4) of the Health Act, No. 61 of 2003, Section *25* (1) and (2) assigned the relevant Member of the Executive Council (MEC) where it is indicated that "he/she must ensure the implementation of the national health policy, norms and standards in his or her province. The head of a provincial department must, in accordance with national health policy and the relevant provincial health policy in respect of or within the relevant province, (r) provide occupational health services (v) ensure health systems research;

and (w) provide services for the management, prevention and control of communicable and non-communicable diseases" (South Africa. National Health Act, 2003:34).

2.13.2.2 Occupational Health and Safety Act and Regulations No. 85 of 1993

This Act of Parliament was passed in 1993. The Occupational Health and Safety Act, No. 85 of 1993. This legislation provides for more protection of employees as well as responsibilities of the employer to ensure that the workplace is safe and hazard free. Whilst it covers the roles and responsibilities of employers and employees, the duties assigned to the employer according to Section 8 are as follows:

- "Every employer shall provide a working place that is safe and without risk to the employees;
- Take measures to eliminate potential hazards to employees through the development of relevant protocols/guidelines and the maintenance of systems;
- Provide necessary information, instructions, training and supervision to ensure the health and safety of employees;
- Refuse an employee to undertake any work that may be dangerous to the health of other employees or the employee, and
- Inform every employee on health and safety hazards attached to the employee's work that he has to perform and precautionary measures applicable to those hazards".

The Occupational Health and Safety Act, No. 85 of 1993, regulations (2001) on Hazardous Biological Agents (HBA) ensure protection of HCWs against HBA.

2.13.2.2.1 Definition of Hazardous Biological Agent (HBA)

A Hazardous Biological Agent (HBA) is defined in the Occupational Health and Safety Act, No. 85 of 1993, as "micro-organisms, including those that have been genetically modified, pathogens, cells, cell cultures and human endo-parasites that have the potential to provoke infection or toxic effects, subdivided into the following groups".

There are four groups and according to the act the BBPs from needle stick injuries (NSIs) form part of group two (2) and three (3), namely:

- Group 2: HBA, "... that may cause human disease and be a hazard to exposed person, which is unlikely to spread to the community and for which effective prophylaxis and/or treatment is usually available".
- Group 3: HBA, "... that may cause severe human disease, which may present a serious hazard to exposed persons and which may present a risk of spreading to the community, but for which effective prophylaxis and/or treatment is available" (South Africa. Occupational Health and Safety Act, 1993:Online).

These two groups 2 and 3 are applicable to this study as the HCWs are exposed to such hazardous biological agents, (BBPs) for example hepatitis B virus (HBV), hepatitis C virus (HCV), or Human Immunodeficiency Virus (HIV) due to needle stick injuries (NSIs). The Hepatitis B virus (HBV) and the Human Immunodeficiency Virus (HIV), may cause human disease and be a hazard to the exposed person, though has effective prophylaxis and/or treatment which is usually available. On the other hand, some of these viruses can be a hazard to the exposed person, and can cause severe human disease for example; the hepatitis C virus (HCV) does not have a vaccine, as prophylaxis post exposure to NSIs, and has the potential to cause liver cancer.

Section 4 (h) of the Hazardous Biological Agent (HBA) regulations, instructs the employer to "... ensure safe working procedures regarding the use, handling, storage, labeling, and disposal of HBA before an employee is exposed or may be exposed" (Regulations on Hazardous Biological Agent (HBA) 2000:2-14). In this study, the researcher investigated the procedures that exposed HCWs to NSIs as well as the disposal of needles after use. The injured HCWs are to be compensated after the injury occurred, and they are protected by the Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993 (COIDA) (South Africa. Compensation for Occupational Injuries and Diseases Act, 1993:1-56).

2.13.2.3 The Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993 (COIDA)

The Compensation for Occupational Injuries and Diseases Act (COIDA), No. 130 of 1993) indicates that "... an employee is entitled to the benefits of the Act if she/he sustains an injury as a result of an incident which arose from her/his duties and in the course of her/his duties, or if she/he contracts an occupational disease for which compensation is payable as a result of the nature of her/his activities" (South Africa. Compensation for Occupational Injuries and Diseases Act, 1993:19;37).

In this study the researcher investigated whether the HCWs reported their NSIs to the occupational health clinics or at the casualty/emergency department after exposure, to ensure that their NSIs are reported accordingly and they are compensated as such. If the HCWs failed to report the NSIs and are developing acquired occupational diseases due to NSIs (acquired HIV), the HCWs would not be compensated for contracting such occupational disease. The COIDA gives the employee the right for compensation if injured in the course and scope of their employment. This would include compensation for HIV infection if it can be shown that the employee was infected in the course and scope of their employment (Grant, Strode & Smart, 2002:20).

2.14 COST OF NEEDLE STICK INJURIES (NSIs)

The United States General Accounting Office (2000:Online) assessed the selected cost and benefit implications of needle stick injury prevention devices for hospitals. It was indicated that occupational HIV and hepatitis sero-conversion is relatively rare but the risks and costs associated with NSIs and blood borne pathogens (BBPs) exposure are serious and real. Costs include the direct costs for example the initial and follow-up treatment of exposed HCWs, which are estimated to range from $500 to $3,000 depending on the treatment provided. The author indicated that the costs that are more difficult to quantify include the emotional cost associated with fear and anxiety, from worrying about the possible consequences of an exposure and implications for the relationship with a partner. The other costs include direct and indirect costs associated

with drug toxicities and lost time from work, and the societal cost associated with an HIV or HCV sero-conversion; the latter includes the possible loss of a worker's services in patient care, the economic burden of medical care, and the cost of any associated litigation.

The CDC (2004:Online) supports the United States General Accounting Office (2000:Online), and estimates that the direct costs associated with initial follow-up and treatment of healthcare workers who sustain a needle stick injury range from $500 to $3,000. These costs depend upon the type of treatments provided. These costs were based on estimates of direct costs to the hospital for follow-up of needle stick injuries on financial data provided by two randomly selected hospitals (labeled hospitals A and B) reporting to the Exposure Prevention Information Network (EPINet) between 1995 and 1997 (Jagger, Parker & Perry, 2001:78). These hospitals reported costs including laboratory charges for blood testing, costs associated with treatments for HBV, HCV, and HIV, service charges, and costs falling into any other category. From June of 1995 to May of 1997 it was found that total costs ranged from $197 to $1094 between the two hospitals, with an average cost of $672 per injury at hospital A and an average of $539 at hospital B.

According to O'Malley, Scott, and Gayle (2007:774-782) a needle stick or sharps injury's emotional cost to the injured health care provider and his/her family can be devastating. In addition, the employer is faced with post-exposure evaluation, follow-up, and treatment costs. Short-term costs alone, which include time spent to report, manage, and track an exposure; salary for the injured HCW; actual costs for laboratory testing of source patient and exposed HCWs; and post-exposure prophylaxis are estimated to be $2,456, ranging between $907 to $4,838. In the case of a seroconversion, the costs to the injured HCWs, health care organizations/hospital, and insurers are far greater.

In addition to monetary costs, the employer can also potentially face legal action if an injured HCW, file a suit against the institution's officers based on the theory that there was an intentional failure to provide safe tools, thereby creating an unsafe work environment. Several legislations (as discussed above) states that employers should

provide safe and hazard free working environments, to protect the health and safety of workers.

Leigh, Gillen, Franks, Sutherland, Nguyen, Steenland and Xing (2007:2093-2105) supports other authors where their study on cost estimate of needle stick injuries and subsequent hepatitis and HIV infection reported that of the 644,963 needle stick injuries in the healthcare industry for 2004, 49% incurred costs. Medical costs were $107.3 million of which 96% resulted from testing and prophylaxis and 4% from treating long-term infections (34 persons with chronic HBV, 143 with chronic HCV, and 1 with HIV). Lost-work productivity cost $81.2 million, of which 59% involved testing and prophylaxis and 41% involved long-term infections. Combined medical and work productivity costs summed to $188.5 million. Multi-way sensitivity analysis suggested a range of combined costs from $100.7 million to $405.9 million.

2.15 CONCLUSION

This chapter discussed literature on needle stick injuries (NSIs) and blood borne pathogens (BBPs). The researcher has confirmed through literature review that there is a need to investigate reported needle stick injuries (NSIs) amongst HCWs. Literature has given evidence that exposure to NSI can cause transmission of blood borne infections such as hepatitis B virus (HBV) hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) Calfee (2006:6). The risk of exposure to a needle stick injury is aggravated by human resource factors (inadequate staffing and poor organizational factors) (Aiken, Clarke & Sloane, 2002:Online) as well as other workplace factors, such as, device type and design of needle; work practices; and work organizational factors (CDC, 2004: Online).

Furthermore literature has indicated an issue of training of health care workers (HCWs) on the risk and the importance of reporting every incidence of NSIs as well as management of NSIs. The study conducted by Alcorn (2004: Online), in 2002 at Durban, McCord Hospital, supported that there is a need to train HCWs on the process of NSI. It was indicated that even where policies for management of NSI and BBP for

HCWs are in place, widespread lack of knowledge and training may remain a major obstacle to care. Knowledge testing was done with a questionnaire on a population of 500 HCWs where they had to respond to basic medical procedures inquiry related to post exposure to NSIs and HIV infection. Doctors and nurses were asked to rate the following statements as true or false:

- A rapid test done the same day would tell if the person had been infected with HIV by a NSI;
- A health care worker who went on to antiretroviral (ARV) treatment after a NSI would be cured of pre-existing HIV infection, and
- One month of ARV treatment would decrease the chance of getting HIV from the injury (Alcorn, 2004: Online).

The study showed that 50% of trained nurses who responded to the questionnaire were unable to give the correct answers; only the final statement was true according to Alcorn (2004: Online). This indicates that there is a need for HCWs training on policy, guidelines or protocols on management of post exposure to NSIs and BBPs. The following chapter will discuss the Research Methodology.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter discussed literature on needle stick injuries (NSIs). In this chapter the research method used to accomplish the aim of this study will be discussed. The aim of the study was to investigate reported needle stick injuries (NSIs) amongst health care workers (HCWs) in regional hospitals in the Free State Province.

An outline of the research method will be presented. This will include a description of the research design, the population and method of sampling. The techniques applied in order to collect data and the analysis of this data will be outlined. Furthermore the pilot study will be described and an account of the study's validity and reliability given. The ethical considerations and the study limitations will be specified.

3.2 RESEARCH METHOD

According to Polit and Beck (2004:15) the research method used by the researchers is intended to structure a study and stipulates how to gather and analyze information relevant to the research question. Several authors (Uys & Basson, 2000:51; Polit & Beck, 2004:15; Burns & Grove, 2005:26 and Polit, Beck & Hungler, 2001:13) discuss the two scientific research methods namely, qualitative and quantitative research. Both of these methods are reviewed to generate knowledge for clinical practice outcomes and intervention research.

The quantitative research method is defined by Burns and Grove (2005:281) as "… a formal, objective, systematic process in which numerical data are used to obtain intervention". Polit *et al.* (2001:13 & 469) agree with what Burns and Grove (2005:281) has indicated and state that quantitative research is "… a general set of orderly, disciplined procedures used to acquire information where phenomena lend themselves to precise measurement and quantification". Uys and Basson (2000:51) specify that the quantitative method involves determining the prevalence, incidence, size and measurable attributes of a phenomenon and that theory is tested by using structured instruments and numbers are used to analyze data".

In this study a quantitative research method was used to investigate the NSIs amongst the HCWs of the Free State Province Department of Health (DoH) public health sector regional hospitals as they naturally happened (Burns & Grove, 2005:281). Needle stick injury (NSI) theory was tested using a structured instrument, which in this study was a questionnaire, documenting the incidents of reported needle stick injuries (NSIs) and thus obtaining numeric data to be analyzed.

In order for the researcher to come up with pertinent study findings as evidence based to use in recommendations, there was a need to acquire accurate interpretable data on reported needle stick injuries (NSIs) amongst health care workers (HCWs) of the Free State Province Department of Health (DoH) public health sector regional hospitals. Polit *et al*. (2001:40 & 167) and Burns and Grove (2005:247) stated that to come up with research findings a plan or framework, namely, the research design is needed to spell out information that is accurate and interpretable.

3.3 RESEARCH DESIGN

Different authors such as Polit *et al*. (2001:40 & 167) and Polit and Beck (2006:54) define a research design as "... the plan for obtaining answers to the questions being studied and for handling some of the difficulties encountered during the research process". Burns and Grove (2005:185) on the other hand define research design as "... the blueprint for conducting a study that maximizes control over factors that could interfere with the validity of findings". Uys and Basson (2000:38) add to the above authors' views that the research design is a structural framework that guides the researcher in the planning and implementation of the study while optimal control is achieved over factors that could influence the study. Uys and Basson (2000:37) further expand on the definition of research design and interpret the research design in two ways:

- Total strategy for the study from identification of the problem to the final plans for collecting data, and
- Structural framework within which the study is to be implemented (Uys & Basson, 2000: 37).

In this study the researcher ensured that correct answers to the questions investigated were obtained by working closely with the two domain experts from the time the study was planned, up to the end. Consultation with a biostatistician expert was also done regularly to review the data collection tool that spelt out information that was accurate and interpretable. Corrections were made according to comments and suggestions from experts. Follow up appointments, to verify changes made to comments, was regarded as a control measure to prevent factors that could influence the study negatively.

Polit and Beck (2006:54) also stated that in quantitative studies, a research strategy move from the starting point of the study (posing a question) to the end point (getting an answer) in fairly sequential steps. This strategy was followed by the researcher in the study by implementing a series of steps.

Firstly, the identification of the study problem in this study was to investigate reported needle stick injuries (NSIs) amongst HCWs in the Free State Province Department of Health (DoH) public health sector regional hospitals. Secondly, the problem of NSIs was confirmed by the monthly statistics (unpublished data) which include the statistics of reported NSIs as documented on the injury on duty (IOD) register, and sent to the Provincial Occupational Health Unit (POHU) where the researcher is employed as occupational health nurse practitioner (OHNP).

These statistics depicted an increase on needle stick injuries (NSIs) amongst the different categories of health care workers (HCWs) and raised an alarm which the researcher needed to investigate in depth.

Thirdly, there was a need to validate what literature said about the identified problem (NSIs) by reading about other authors' studies. Polit and Beck (2004:48) accentuates the importance of activities with a strong conceptual or intellectual element. In this study the researcher applied the study's conceptual phase, where an intense literature search on previous studies on NSIs and related factors were done. The researcher in this phase applied creativity and reasoning skills, theorizing and reviewing ideas with study leaders. It was therefore confirmed that the reality was that health care workers (HCWs) face a risk of acquiring blood borne pathogens (BBPs) due to needle stick injuries (NSIs). There was a need to first conduct the research.

According to Polit *et al*. (2001:167) and Polit and Beck (2004:49) quantitative research design involves decisions with regard to the following aspects of the study:

- Will there be an intervention? In this situation the researcher's study will make recommendations to the Free State Province Department of Health (DoH) public health sector regarding prevention and management of NSIs;
- What types of comparison will be made? Research results will be compared amongst different categories of HCWs who sustained NSIs to identify the most vulnerable HCW category of all; for example doctors and professional nurses, and
- In what setting will data be collected? Polit *et al*. (2001:167) indicate that in some quantitative studies, data collection needs a real world setting, such as clinics and hospitals. In this study the researcher collected data from the previous mentioned hospital settings (See table 3.1), as it was easy to access the sample for the study and much more convenient during working hours than after work. Different authors, Uys and Basson (2000:38) as well as Burns and Grove (2005:30) further elaborated the research design by classifying the different types. These will suite the type of research method to be used in this study.

3.3.1 CLASSIFICATION OF RESEARCH DESIGNS

Uys and Basson (2000:38) classify the research design into three main categories, namely exploratory, descriptive and explanatory. On the other hand Polit and Beck

(2004:175-197) specify two research designs for quantitative studies, namely experimental and non-experimental. The experimental design was not appropriate for this study. To achieve the aim and the objectives of this study, a non-experimental research design which is descriptive and retrospective was used. The researcher needed to explore and find explanations or descriptions on how HCWs sustain NSIs.

3.3.1.1 Exploratory design

According to Polit and Beck (2004:20,718) and Burns and Grove (2005:798) exploratory research designs investigates the full nature of the phenomenon, the manner in which it is manifested, and the other factors to which it is related. In this study the researcher explored the effects of NSIs, for example what the HCWs did immediately after sustaining NSIs. The pattern of reactions to NSIs was assessed in relation to policies regarding post exposure.

3.3.1.2 Descriptive design

Polit *et al*. (2001:184) define the descriptive research design "… as an empirical driven design which classifies specific dimensions; characteristics of individuals and groups by summarizing similarities found in observation or the frequency with which the phenomena occurs". According to Uys and Basson (2000: 37-38) descriptive research is the collection of accurate information on the domain phenomenon to be studied. Burns and Grove (2005:248) indicate that descriptive research is valuable to gain more information on characteristics needed to provide a picture of the situations as they naturally occur.

The descriptive study design played an important role in this quantitative study because it served to make research findings meaningful and interpretable. It assisted in the purpose of developing theory, identifying problems with current practices that led to NSIs, verifying present practices or determining what others in the current situations are doing (Burns & Grove, 2005:248). In this study the research purpose was to obtain information as described by HCWs and document accurate information on aspects of situations of NSIs as they naturally occurred (Polit & Hungler, 2001:195-196).

Katzenellenbogen, Joubert and Abdool-Karim (1997:64) state that a descriptive study aims to determine the size, the demographic or geographic factors of the study problem being investigated. The researcher needed information on how many HCWs reported NSIs; the demographic information namely which category of health care workers were injured; geographic information namely where they were working when they sustained the NSIs as well as the distribution of the problem.

3.3.1.3 Explanatory design

Burns and Grove (2005:797-98) indicate that an explanatory research design assists to clarify relationships among phenomena and identifies why events occur. Polit and Beck (2004:20) state that the goals of an explanatory research design assist in understanding the underpinnings of specific natural phenomena, and to explain systematic relationships among phenomena. This study investigated events that led to NSIs as well as management of NSIs, for example the type of procedures that health care workers (HCWs) performed when they sustained NSIs.

3.3.1.4 Retrospective design

It is the study design that begins with the manifestation of the variable in the present and then searches for the presumed cause occurring in the past (Polit & Beck, 2004:730). In this study a group of HCWs were identified as they had experienced exposure to NSIs in the past year(s). To obtain a systematic explanation and description on NSIs there was a need to get real situations or to question the target population.

3.4 RESEARCH TECHNIQUES

In quantitative research, data can be collected by means of questionnaires, checklists, indexes and scales (De Vos, Strydom, Fouché & Delport, 2004:170). In this study the data collection tool used was a questionnaire. A questionnaire is defined as "... a method of gathering self-report information from respondents through administration of

questions in a paper-and-pencil format" (Pilot & Beck, 2004:729). Uys and Basson (2000:58) stated that "If you need information from someone, ask him for it". Polit, Beck and Hungler (2001:469) and De Vos *et al*. (2004:174) indicate several types of questionnaires including mailed, telephonic, personal, hand delivered and group-administered. The phenomenological approach in establishing an understanding of the behaviour of health care workers (HCWs), who reported a needle stick injury (NSIs), was achieved through conducting a recorded questionnaire (Uys & Basson, 2000:75). The researcher in this study mailed questionnaires to the field workers of the Free State Province Department of Health (DoH) public health sector regional hospitals in the following districts: Thabo-Mofutsanyane, Lejweleputswa and Fezile Dabi and hand delivered questionnaires to Motheo district hospitals.

3.4.1 QUESTIONNAIRE

The researcher constructed a questionnaire based on a literature review compiled from available data, for example policies and procedures available in the Free State Province Department of Health (DoH) on management of needle stick injury (NSI) and blood borne pathogens (BBPs) as well as existing questionnaires from the Exposure Prevention Information Network (EPINet, 2003:online). There was no need to obtain permission to use or adapt the EPINet questionnaire (more discussion on EPINet in Chapter 2). It was with the information gained from the review that the researcher was able to adapt and develop a questionnaire.

In this study the questionnaire was used as the tool to gather accurate responses from the health care workers (HCWs) who reported needle stick injuries (NSIs). To justify the use of the questionnaire Uys and Basson (2000:65) indicated that a questionnaire allows enough scope to enquire or obtain the information needed from each respondent. Robson (2003:5) reported that quantitative questionnaires enable the researcher more structure so as to sequence the questions as well as allowing for the amount of time spent in completing the questionnaires. Open-ended and closed-ended questions were formulated to obtain the required information (Polit *et al*., 2001:267).

3.4.1.1 Open-ended questions

According to Burns and Grove (2005:336) open-ended questions allow respondents to respond in their own words, while Polit and Beck (2004:349) indicated that open- ended questionnaires allow issues to be probed, revealing responses which the researcher might never have imagined. In this study open-ended questions were asked to obtain explanations and descriptions from HCWs on NSIs and associated information for the study.

3.4.1.2 Closed-ended Questions

The closed-ended questions offer respondents a number of alternative replies, from which the subjects must choose the one that most closely matches the appropriate answer. The alternatives may include a simple yes or no (Polit & Beck, 2004:349). Crombie and Davies (1997:213) describe closed-ended questions as having the risk of prompting respondents to select one answer, even if none applies, though it is easy to simplify the data processing with closed questions. This research used close-ended questions as well, as some of the information and answers needed on variables were standardized or limited; there were no explanations or descriptions necessary.

Polit and Beck (2006:294) indicated that both closed- and open-ended questions have strengths and weaknesses. They reported that closed questions are more difficult to construct than open ended questions, though easier to administer, and, to analyze. Furthermore, closed-ended questions' drawback is that some potentially important responses may be overlooked as they can be superficial. Though Polit and Beck (2006:294) reported that closed-ended questions are more efficient, but open- ended questions allow for richer and fuller information if the respondents are verbally expressive and cooperative. Study respondents tend to complete more closed-ended questions than open-ended questions in a given amount of time. Lengthy questions may lead to a poor response rate.

In this study the researcher did not experience difficulty to construct open-ended questions. Literature review was done intensively to use relevant data to obtain study information. There were several evaluations and discussions done by the study supervisors, domain experts as well as the biostatistician during development of the questionnaire (see Figure 3.1) with which data was gathered. The researcher agrees with the comment made by Polit and Beck (2006:294) regarding the efficiency of closed-ended questions because in this study it was easy to administer closed questions. Open ended questions were also easy to administer as they were well constructed. A pilot study of the questionnaire was done to ensure that questions were not confusing either to the field workers or the respondents.

This study questionnaire had three sections, namely:

- Section A on the questionnaire consisted out of nineteen (19) questions dealing with practices of health care workers (HCWs) of which sixteen (16) were closed-ended questions and three (3) open-ended questions;
- Section B on the questionnaire consisted out of 8 questions dealing with practices leading to needle stick injuries (NSIs). Three (3) questions were closed-ended and five (5) were open ended questions eliciting the reasons for poor practices, and
- Section C on the questionnaire deals with management of needle stick injuries (NSIs) and it consisted out of sixteen (16) questions. Eight (8) questions were closed-ended questions and eight (8) were open-ended questions.

Figure 3.1 below illustrates the steps followed in the development of the questionnaire. The questionnaire was used to interview the HCWs who were included in the study.

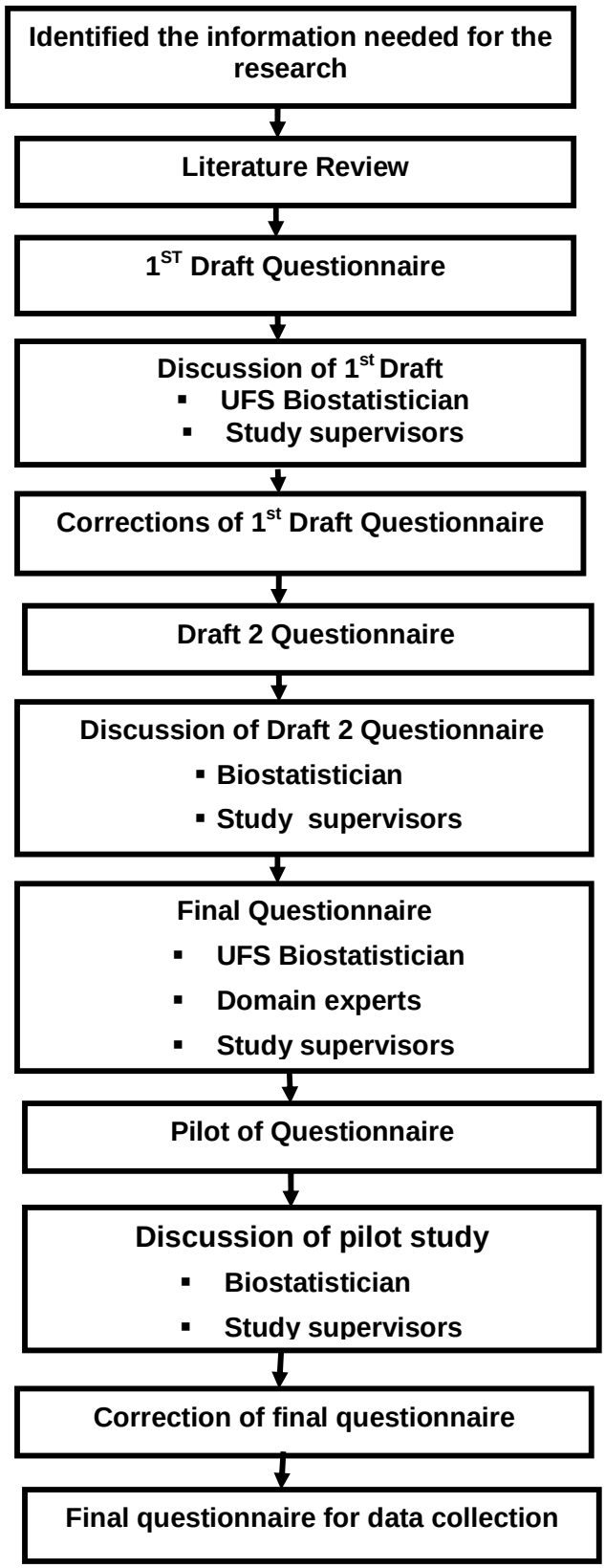


Figure 3.1: Steps followed in the development of the questionnaire

3.4.1.3 The interview

Burns and Grove (2005:420) define an interview as verbal communication which poses a series of questions for the respondents in a face to face situation. Uys and Basson (2000:58) define an interview as "... the personal conversation through which research information is obtained, or a technique in which the researcher poses a series of verbal questions for the respondents in a face to face situation". According to (Polit & Beck, 2004:319) this is the ideal method to gather research information, by questioning people, talking to them and asking them questions directly or communicating to them verbally.

However, Polit and Beck (2004:320,340-341) call this method self reports (see chapter 1) and further elaborate that "... if we want to know what people think, feel or believe, the most efficient means to gather information is to ask them about it". It was further indicated that self report data can be gathered either orally in a structured interview, or in writing in a written questionnaire.

In this study the researcher used both methods; interviews and self reports to obtain information needed by communicating verbally and face to face with the health care workers (HCWs) and by asking them questions on needle stick injuries (NSIs) (See questionnaire Annexure D). The rationale for this decision was because of the following strengths of these methods:

- The response rate tends to be high in face to face interviews;
- Respondents are less likely to refuse to talk in an interview than to ignore the questionnaire. Low response rates can lead to study bias. Respondents are less likely to give "don't know" responses in an interview ;
- Interviews are feasible with most people and yield information that would be difficult, if not impossible to gather in a different manner;
- Behaviours and psychological characteristics can be directly observed through direct communication with respondents;

- Questions are less likely to be misinterpreted by respondents because the interviewers can determine whether questions have been understood. Interviews offer some protection against ambiguous or confusing questions;
- The interviewer can enhance the quality of information needed through probing;
- When the interviewer uses the questionnaire there is liberty to have control over the question ordering, and
- The interview gives control on who answers the questionnaire namely the intended respondents who met the study criteria. If not conducted by means of an interview, the questionnaire could be passed to a friend or family member, thus changing the intended study composition (Polit *et al*., 2001: 270; Polit & Beck, 2004:351 and Polit & Beck, 2006:302).

Self reports and interviews using questionnaires addressed the aim and objective of this study as indicated in Chapter one (1). Uys and Basson (2000:59) indicated that in order to ask relevant questions which will not confuse the respondents, and to put the respondent at ease during the interview, there are principles that are to be considered by the interviewer. They are the following:

- The interviewer must learn to be sensitive to misunderstanding;
- The interviewer must be prepared for and alert in identifying and coping with ambiguous or misleading answers, and
- The interviewer must improve her technique by remaining responsible to the purpose of the interview, as well as to the interaction between herself and the respondent.

In this study the researcher ensured that these principles were considered and implemented during the interview and understood by the field workers as well. The researcher included these principles during training of the data collectors (full discussion of training field workers is indicated in 3.9). The researcher avoided misunderstanding and ambiguous misleading answers and ensured good interaction between the field workers and respondents by making sure that the instrument used to collect data was easily understood by both the field workers and respondents. Long confusing questions

were avoided and the questionnaire's reliability and validity was ensured by the researcher and the domain experts in the field of research. The researcher and field workers were all qualified OHNPs, working at the Department of Health (DoH), where the research was conducted and were familiar with the workplace. Working in the areas (hospitals) where the research was conducted, was advantageous for the field workers who could build a rapport with the health care workers (HCWs). There were no limitations that influenced the interview negatively, thus the interview was conducted with ease and good quality data needed for the research was obtained.

3.5 POPULATION AND SAMPLING

3.5.1 POPULATION

Burns and Grove (2005:47) Polit *et al.* (2001:278) define the population as all the elements that meet a certain criteria for inclusion in a given universe. Population according to Uys and Basson (2000:86) "... includes all members or units of some clearly defined group with distinguishing criteria of people, objects or events". This definition links to that of Polit and Beck (2004:290) that a population is not restricted to human subjects but it can be based on the entire aggregation of elements that the researcher is interested in. In this study the population which the researcher used was all the full time employed HCWs of the Free State Province Department of Health (DoH) public health sector regional hospitals who reported sustained NSIs and documented on the Injury on Duty (IOD) registers at the Occupational Health Clinics (OHCs) from January 2006 to June 2007. Such research where the entire target population was used is referred to as population studies (Burns & Grove, 2005:366).

3.5.2 THE DISADVANTAGE OF POPULATION STUDIES

The disadvantage of population studies as indicated by Burns and Grove (2005:366) is that the research target population can be limited by unforeseen circumstances or unavoidable situations in health care facilities. In this study, there were some of the HCWs who met the study criteria but were not accessible during data collection. This was due to unforeseen circumstances, for example, some of the HCWs were no longer

working in those hospitals where they sustained NSIs. This was indicated by the occupational health nurse practitioners (OHNPs) of the different occupational health clinics (OHCs) from different hospitals. However, the researcher managed to obtain a target population of 105 of which 5 was included in the pilot study. A full discussion of study limitations will be done later in this chapter.

3.5.3 SAMPLING METHOD AND SAMPLES

3.5.3.1 Sampling

Sampling methods are defined by different authors as the process of selecting a portion of the population to represent the entire population or the group of people, events, behaviour, and elements with which to conduct the study (Polit & Beck, 2006:260; Uys & Basson, 2000:87 and Burns & Grove, 2005:39). There are two broad classes of sampling methods, namely: probability or random sampling and non- probability or non-random sampling methods.

3.5.3.2 Sample

A sample is the subset of population elements (Polit & Beck, 2006:260). The research sample was representative and had key characteristics closely approximate to those of the population. In this study there was no sampling done as the whole HCWs population 105 who reported NSIs and documented in the injury on duty (IOD) register were included in the study. Out of 105 the five (5) HCWs who were used for the pilot study were not included in the major study. The HCWs who were included in the study were injured during the period January 2006 to September 2007 as indicated in Table 3.1 below. The reason for the exclusion of other HCWs' categories will be explained later in this chapter.

The researcher used the entire accessible population of 105 HCWs. The accessible population is the aggregate of cases that conforms to the eligibility criteria and are accessible to the pool of subjects for the study (Polit & Beck, 2004:290). Burns and

Grove (2005:366) define accessible population as the portion of the target population to which the researcher has reasonable access to obtain the sample. In this study the target population was reasonably accessible as they were all employed by the Free State Province Department of Health (DoH) public health sector regional hospitals at the time of the needle stick injuries (NSIs). The health care workers' (HCWs) data for NSIs were also reasonable accessible from the DoH occupational health clinics (OHCs), Injury on Duty (IOD) registers.

The categories of HCWs included: doctors, professional nurses; staff nurses; auxiliary nurses) and general assistants as defined in Chapter 1. The study population consisted of HCWs as depicted in Table 3.1 below of the four Free State Province districts' regional hospitals namely: Motheo; Thabo-Mofutsanyane, Lejweleputswa and Fezile Dabi. Xhariep district was not included in this study as it has no regional hospital.

3.5.3.3 Inclusion Criteria

According to Burns and Grove (2005:367) inclusion criteria are characteristics that must be present for the element to be included in the sample. The following inclusion criteria were considered in the selection process:

- Only HCWs who reported NSIs and whose injury was documented on the occupational health clinic (OHC) injury on duty (IOD) register;
- HCWs who were working in the Free State Province Department of Health (DoH) public health sector regional hospitals at the time of a NSIs in the four (4) districts of the Free State Province, namely, Motheo, Fezile Dabi, Thabo Mofutsanyane and Lejweleputswa, and
- Only the following categories of HCWs were included: doctors, professional nurses, staff nurses, auxiliary nurses and general assistants.

3.5.3.4 Exclusion criteria

The following is a list of factors according to which HCWs and hospitals were excluded from the study:

- District hospitals were not used for the study as the ward/department or unit set-up differ per hospital, per district and from regional hospitals which would make it difficult to compare the work area;
- The Xhariep district has no regional hospital and was therefore excluded;
- HCWs who were not full time employees for example all students who sustained NSIs, were excluded from the study as well as part time or contract HCWs;
- HCWs who sustained NSIs after the period September 2007, and
- HCWs who sustained NSIs but did not report to the occupational health clinics (OHCs) and were not documented on the injury on duty (IOD) registers.

3.5.4 PROBLEMS ENCOUNTERED

Initially it was planned to include 105 HCWs who reported needle stick injuries from January 2006 to June 2007. Of the 105 HCWs, five (5) was intended for the pilot study and the data obtained from the respondents was not included in the major study, as the purpose of the pilot study was to test the validity and reliability of the questionnaire. The intended number of respondents included in each category was 46 doctors, 26 professional nurses, 5 staff nurses, 12 auxiliary nurses and 16 general assistants as indicated in Table 1.1 of chapter 1.

However, at the end of November 2007 only 63 data of HCWs' could be collected of the anticipated study total of 100 HCWs as depicted in the statistics on Table 1.1 for the period January 2006 to June 2007. The reason for this was that some HCWs moved from the Provincial Department of Health and some did not meet the inclusive criteria for example part time agency workers. HCWs involved in these reasons were within the doctor and professional nurse categories. To maintain a total of 100 HCWs for the study, the researcher together with the study supervisors and the biostatistician decided to consider adding statistics of HCWs who sustained NSIs for the period July 2007 to September 2007. Finally, a total of 100 HCWs, namely, 36 doctors, 30 professional nurses, 5 staff nurses, 15 auxiliary nurses and 14 general assistants were included in the study, exclusive of the 5 HCWs for the pilot study. The final distribution of the HCWs

in each category that was included in this study for the period January 2006 to September 2007 is depicted in Table 3.1.

Table 3.1: Health care workers (HCWs) included in each category from the four Free State Province districts' regional hospitals: January 2006 – September 2007

		PROFESSIONAL HCWS				SUB PROFES-SIONAL HCWs	TOTAL
District	**Regional Hospitals**	**Doctors**	**Professional Nurses**	**Staff Nurses**	**Auxiliary Nurses**	**General Assistant**	
Lejweleputswa	Bongani	**9**	**2**	**2**	**1**	**0**	**14**
Motheo	Free State Psychiatric Complex		**1**	**0**	**0**	**0**	**1**
	Pelonomi	**6**	**11**	**1**	**4**	**7**	**29**
	Universitas Academic	**9**	**11**	**0**	**3**	**2**	**25**
Fezile Dabi	Boitumelo	**2**	**0**	**0**	**2**	**4**	**8**
Thabo-Mofutsanyane	Mofumahadi Manapo-Mopeli	**5**	**4**	**2**	**3**	**0**	**14**
	Dihlabeng	**5**	**1**	**0**	**2**	**1**	**9**
TOTAL		**36**	**30**	**5**	**15**	**14**	**100**

3.6 PILOT STUDY

A pilot study is a small scale study, or trial run for a major study; done to obtain information for improving the project or assessing its feasibility and to give the researcher experience with the subjects, setting, and methodology in order to refine the data collection instrument (Polit *et al*., 2001:467).

The researcher conducted the pilot study at Universitas hospital as the hospital had high statistics of reported NSIs and secondly it was cost effective for the researcher as there were no travelling expenses. A random selection was done for the pilot study,

whereby the researcher wrote all names of the study population each on a separate piece of paper. She then put the names of the different categories of the doctors, professional nurses, staff nurses, auxiliary nurses and general assistants (separate) in a hat and selected one per health care worker (HCW) category. One (1) respondent per category of HCW as selected were interviewed for the pilot study. These respondents were excluded from the main study.

All pilot study respondents met the inclusion criteria as indicated above (See 3.5.3.3) in this chapter, to ensure data validity and reliability of information needed for the major study. The researcher phoned the HCWs who were chosen for the pilot study to secure an appointment depending on their available time and explained the reason for the appointment. Each HCW gave her/his available time and venue (within Universitas hospital ward/unit or department) as their workplace at which to be interviewed.

Approved copies to conduct the study from the University of the Free State Ethics Committee and Free State Acting Head of the Department of Health (DoH) and the questionnaires were duplicated. These copies were shown to the respondents to ensure the legal implication as well as to obtain their informed permission to participate in the pilot study. The statement of agreement as stated on the questionnaire was read to the HCWs to obtain their verbal agreement to participate in the research study. Data were collected after the respondent granted their verbal permission to be interviewed. The respondents who participated in the pilot study were excluded from the major study and their information was not included in the results of the major study.

There were no study limitations noted by the researcher during data collection in the pilot study. All HCWs who were interviewed, responded well to all the questions. The pilot study took two (2) days due to the availability of the respondents. The interview time frame differed; it lasted for 15-20 minutes for each respondent. The researcher discussed the results of the pilot study outcome with the two study supervisors and the biostatistician in order to benefit from their expertise and to refine the questionnaire. They were in agreement that some questions had to be added and some had to be adapted as follow:

Some questions were divided into two or more, for example: Section A on information on NSIs:

Question 14 initially read:

What was the source of your injury?

1	Deep intra-muscular injury/injection
2	Needle used in a vein/artery
3	Superficial injury
4	Source patient unknown
5	Source patient was HIV positive
6	Source patient was HIV negative
7	Other, please specify

This question was changed and divided into two questions and read:

Question14	How deep was your needle stick injury?	
	1	Deep
	2	Superficial
Question 15	What was the HIV status of the source?	
	1	HIV positive
	2	HIV negative
	3	HIV status unknown

Question 15 was initially one question with three options:

Which of the following were done after your exposure to a needle stick injury?

Pre-counselling ☐

Post-counselling ☐

Follow-ups ☐

Question 16 was changed to six different questions namely:

Question 16:

“Did you get Pre-test counselling after your exposure to a needle stick injury?

☐ Yes

☐ No.

Question 17:

If not, explain why not.

Question 18:

Did you get Post-test counselling after exposure to a needle stick injury?

☐ Yes

☐ No

Question 19:

If not, explain why not

Question 42 in Section C on the Management of NSIs was divided into two questions, for example:

Question 42 (Section C):

Did you go for follow up post needle stick injury?

☐ Yes

☐ No

Question 43:

If not, why not?

The reason for changing the initial questions was to get more complete data to be analysed. During the pilot study there were a total of 36 questions and after necessary questionnaire corrections and changes, the major study had 43 questions. The final draft questionnaire changes were approved, validity and reliability was ensured by the study supervisor and the biostatistician who then gave the researcher permission to commence with data collection for the major study (Final questionnaire Annexure D).

3.7 VALIDITY OF THE STUDY

Validity of the study is "… a measurement of the truth or accuracy of a claim; an

important concern throughout the research process" (Burns & Grove, 2005:755). Polit *et al*. (2001:308) indicate that validity is ".... the degree to which an instrument measures what it is suppose to be measuring".

In this study the researcher ensured validity by:

- An extensive literature study prior to compilation of the questionnaire in order to get the correct information to use in compiling the questionnaire. The use of correct information in compiling the questionnaire was done to address the study aim and objectives as indicated in chapter one (1);
- Ensuring that the questions were related to the research topic to avoid study bias or obtaining data which is not related to the topic or inconsistent;
- Several consultations took place with study supervisors, domain experts and the biostatistician to ensure content validity of the questionnaire prior to the pilot study and prior conducting the major study (See Figure 3.1 for steps followed in the development of the questionnaire). Content validity is concerned with adequacy of coverage of the content area being measured (Polit *et al*., 2001:309) However Uys and Basson (2000:81) indicated that content validity focuses on a higher degree of balance and representation, and
- Domain experts in the field of research evaluated the questionnaire which was tested by conducting a pilot study for content validity. This was done to include appropriate questions for the major study and ensure balance in questions which will be understood by both field workers and respondents.

3.8 RELIABILITY OF THE STUDY

Reliability represents "... the consistency of the measure obtained in the use of a particular instrument as an indication of the extent of random error in the measurement method" (Burns & Grove, 2005:749). Uys & Basson, (2000:75) define reliability as "... the degree of consistency or accuracy with which an instrument measures the attribute it is designed to measure". Polit *et al*. (2001: 305) supports these definitions and refer to reliability as an instrument to measure accuracy and reflect on the true measure of the

attribute. Reliability refers to "... meticulous recording and taking of notes during the interviews with respondents and using the same technique in conducting the interview" (Van Vuuren, 2005:99).

In this study the researcher ensured reliability of the study by:

- Training of all field workers, conducted on the same day using the same techniques to be used during the interview and using the same questionnaire to be used for major study. Full discussion on training data collectors will be done in 3.9. The training ensured correct recording and taking of information during the interviews by the field workers;
- The use of the same questionnaire used during training was duplicated, posted/hand delivered to all the field workers by the researcher;
- The use of the environment that was conducive to all HCWs who were interviewed, which was their workplaces, (hospitals) as illustrated in Table 3.1
- Time schedule was suitable for the HCWs, during his/her time away from patient bedside or work procedures, in order to have uninterrupted interview;
- Consistency to include only HCWs who reported needle stick injuries (NSIs) at the occupational health clinics, of the regional hospitals in the Free State province public sector at the time of their injury, was maintained;
- Avoiding circumstances that could hamper getting reliable data from respondents, for example, forcing HCWs to participate in the study or not considering ethical issues in research, for example ignoring the HCWs rights and confidentiality;
- Conducted a pilot study in order to ensure reliability of the data tool (questionnaire);
- Ensured that the respondents were asked the same set of questions;
- Respondents were given the same set of options for their responses for example in closed questions fixed alternative questions were pre-specified by the researcher;
- In closed-ended questions the respondents were allowed to respond to the questions in their own words, and

- The final questionnaire was not used in the major study until approved by the study supervisors and biostatistician after discussion of the results of the pilot study.

3.9 DATA COLLECTION

The quantitative method of data collection takes into consideration the personal characteristics of the interviewer as well as the language with which the respondents are expressing themselves in answering questions (Burns & Grove, 2005:51). Polit and Beck (2004:323) has indicated that data collection in quantitative research ideally should yield accurate, valid and meaningful data that is maximally effective in answering research questions. In this study the questions' responses were collected in the form of words, description of events and situations as they naturally occurred.

The data collection plan was specific to the study being conducted (Burns & Grove, 2005:453) and required consideration of some elements of the research. These elements that needed to be planned in data collection included: the procedure to be used to collect data; the time and the cost of data collection as well as development of the data collection tool that facilitates data entry. The researcher had a step by step plan for data collection as indicated below:

3.9.1 SELECTING FIELD WORKERS

The researcher considered several characteristics when selecting field workers. This was done to ensure that they conducted the interview in a manner relevant to the data that was to be collected. These characteristics included:

3.9.1.1 Prior experience in interviewing

Polit and Beck (2004:330) indicated that ideally it is advantageous to use people with prior experience in interviewing for collection of data, especially if the self report method for collecting data will be used. A questionnaire was used in this study. The selected

field workers had experience in interviews as well as necessary skills needed for this study. They were all qualified occupational health nurse practitioners (OHNPs), who were familiar with the language on the questionnaire and have previously been involved in conducting research in the Free State Province Department of Health (DoH) public health sector regional hospitals.

3.9.1.2 Congruity with study participant's characteristics

Uys and Basson (2000:61) as well as Polit and Beck (2004:330) reported that field workers have to match study respondents' characteristics, with respect to race or cultural background. The field workers matched the respondent's characteristics as they are the care givers of the respondents and are employed by the Free State Department of Health (DoH). All field workers were conversant with the language of the respondents as well as conversant with the cultural background of respondents and the workplaces of the health care workers (HCWs), where the research was conducted. The needle stick injuries (NSIs) were reported to the field workers who are the OHNPs at the occupational health clinics (OHCs). Uys and Basson (2000:62) remarked that preferably the interviewer should belong to the same ethnic group as the respondents. This is important regarding the building of rapport and clearing of cultural obstacles.

3.9.1.3 Appearance

According to Polit and Beck (2004:330) Uys and Basson (2000:62) extremes of appearance should be avoided as study participants may react to extremes and alter their behaviour or response accordingly. The field workers should not dress too casual for example in shorts and T-shirts. In this study the field workers' appearance was within the guidelines of the Department of Health (DoH) ethics. Field workers were dressed neatly to attend to health care workers in a professional manner, which allowed an uninhibited interview, as stated by Polit and Beck (2004:330) and Uys and Basson (2000:62). All the field workers wore work uniforms while at work, which is professional, and the respondents felt secure to talk to people they could identify with and trust.

3.9.1.4 Personality

Field workers should be pleasant and sociable but not overly talkative or overbearing. The goal is to put respondents at ease to talk and answer the questions. Respecting respondents' rights was also encouraged and it was indicated that this should be continued throughout the interviews with all the respondents and that they should be treated with dignity.

3.9.1.5 Listening skills

Uys and Basson (2000:63) indicated that the major task of the interviewer is to listen. Further it may be necessary to probe in order to elicit more useful information from the respondents. Eye contact is important; respondents should not be interrupted especially if the field workers do not agree with a given answer. The researcher emphasized all these characteristics during training of the field workers.

3.9.2 TRAINING OF FIELD WORKERS

The field workers were trained on how to collect data by the researcher. Polit and Beck (2004:331) stated that training can be accomplished in a single day depending on the prior experience of data collectors. Training in this study took one day as the field workers were all occupational health nurse practitioners (OHNPs), who were familiar with the language on the questionnaire and had experience with data collection for research. Field workers had been involved in previously conducted research by the researcher, thus had the necessary skills needed for this study. The researcher conducted training of the occupational health clinic nurse practitioners (OHNPs) from Motheo, Thabo-Mofutsanyane, Lejweleputswa and Fezile Dabi. Xhariep was not included in the study as there is no regional hospital in the district.

Polit and Beck (2004:331) reported that training needs to cover both general procedures for example how to conduct a research interview, and specific procedures, for example

how to administer a questionnaire. The researcher's training covered both areas as indicated by Polit and Beck (2004:331) in this study. Standardized training was censured by the researcher. Uys and Basson (2000:104) indicate that to ensure uniformity and prevent biased data collection, all data collectors should undergo standardized training and receive the same instructions to be passed on to respondents. The researcher trained the field workers to be confident, courteous and to have a good command of the applicable language.

3.9.2.1 How to conduct a research interview

The researcher gave attention to the following details of interviewing:

- The researcher clearly discussed the study aim and objectives as well as how to avoid biased information collected and by making use of skilled qualified occupational health nurse practitioners (OHNPs);
- Greeting the respondent, hand shaking (optional) and introducing themselves and not taking for granted that they already know who you are. Wearing an identification card/badge as provided by the Department of Health (DoH) to all HCWs, would be professional;
- Indicating that information needed will be recorded using the questionnaire, clearly indicating that it was developed by the researcher;
- The researcher trained field workers on characteristics they had to display prior to the interview (when making appointments for interview) for example building trust. The same standards were set for after the interview; for example showing appreciation; giving thanks to HCWs for agreeing to take part in research, their cooperation and for his/her devoted time for interview. A full discussion of interview characteristics was done above;
- Field workers should ensure respondents that the information will be treated confidentially, in a group context, with no names attached;
- The place and circumstances under which data will be collected, should as far as possible correspond (Uys & Basson, 2000:104). In this study, data collection was done at hospitals where respondents were working;

- The researcher emphasized to the field workers during training that respondents should be allowed freedom to decide on suitable times and venues for the interview, though the venue should be at hospital premises which is the workplace (see definition of workplace Chapter 1);
- The researcher enforced adherence to have the interview done at the workplace (different hospitals as indicated in table 3.1) for the fact that NSIs were sustained whilst on duty. During the interview respondents and field workers were regarded as on duty;
- Though the venue should be the workplace, the field workers were made aware that the venue should be away from the patients' bedsides or during the time when the respondents are busy with work procedures. The respondents indicated the time when they would be free for the interview;
- The venue should have chairs for both respondents and field workers, with good ventilation and without other HCWs disturbances;
- The respondent should be informed when securing appointments that the needed time for an interview could be 30 minutes and not more. The researcher estimated 30 minutes as a time frame, as during the pilot study it took the researcher 15-20 minutes to complete a questionnaire for one respondent. Time estimated can rather be less than more, to avoid irritating the respondents when it exceed the expected time frame, especially when they are still on duty;
- Greeting with a smile or a friendly social face was encouraged to build rapport and openness, in order to get relevant information;
- The field workers should confirm the respondent's name and surname to ensure that the respondent is the right person needed for the interview;
- Confirmation should be made again as to whether the respondent had sustained the needle stick injury within the indicated period (January 2006-September 2007);
- The respondents should be allowed time to express their feelings, though the researcher indicated that the field workers should use the interview skills to keep the interview within study aim and objectives, and

- The researcher indicated that no false promises should be made in order to gain cooperation but rather that they should be honest.

The process following training on how to conduct a research interview was specific to this study, which addressed administration of the study questionnaire.

3.9.2.2 Specific training related to this study

Specific training related to this study was on administration of the study questionnaire. Administration of the study questionnaire in this study included the entire process, from the time the researcher and field workers met with the respondents; building rapport, obtaining verbal consent to take part in the study, reading a questionnaire to the respondent, completion of all (43) questions asked, using a black pen, thanking the respondents for their cooperation and their time to complete questionnaire.

The researcher once more explained during specific training related to this study to the field workers that the study's aim and objectives needed to be considered throughout the research interview. The respondent's comfort and confidentiality also need to be maintained. Polit and Beck (2004:365) pointed out that the prime task in administering a research instrument and interview is to put respondents at ease so that they will feel comfortable in expressing their opinions honestly. The field workers were to follow this procedure to administer the questionnaire or collect data:

3.9.2.3 Procedure to use when administering questionnaire or collecting data

The researcher and field workers had to adhere to the following:

- Confirming the time and venue with the respondent the day before; whether the time given was in the morning of the next day for example. The confirmation was done so as to remind the respondent in a polite manner of their appointment as given (by the respondents);
- The researcher and the field workers adhered to the code of ethics to obtain permission from the respondents prior to the data collection, also explaining well what the study is all about in order to get cooperation;
- Limited identification was a preferred method used, according to Uys and Basson

(2000:104). In this study limited identification was used where the respondents were identified but information was processed in group context;

- The field workers were asked not to be late for set appointments. Polit and Beck (2004:365) indicated that the respondent's reaction to interviewers can affect their willingness to participate; therefore, the interviewers should always be punctual if an appointment has been scheduled;
- The field workers should build rapport by greeting and introducing themselves and both should be seated. According to Polit & Beck (2004:365) and Uys and Basson (2000:63) a natural conversational tone is essential in building or establishing rapport;
- The reason for the interview, which is the study aim and objectives, should be conveyed to the respondents. The respondent should be given an opportunity to agree to start with the interview. Uys and Basson (2000:62) indicated that the interviewer should announce to the respondent why the information is important, as well as the purpose of the investigation;
- Respondents were made aware that inclusion criteria for this study was only reported needle stick injuries (NSIs) during the period January 2006 to September 2007 as indicated in the clinic injury on duty (IOD) register of the occupational health clinics (OHCs) of all regional hospitals, as managed by the (OHNPs) of those hospitals;
- Respondents were notified that existing NSIs information of HCWs as on IOD registers with the contact details of respondents was used to identify and track respondents who were included in the study;
- The copies of the study's approval letters were to be read and shown to respondents as proof that the study may be conducted (the University of the Free State Ethics Committee and Acting Head of the Department of Health (DoH Free State Province);
- Explanation on how the questionnaire was constructed should be done. Such information as that the questionnaire consists of three sections should be conveyed to the respondent. The respondent should be made aware that all the answers will be recorded by the field workers;

- Each question should be read out to the respondents and they should be allowed time to respond. There should be no interruption or leading of the respondents. According to Uys and Basson (2000:63) the task of the interviewer is to listen;
- Field workers were repeatedly cautioned that they should not change any question by rephrasing it in their own words as this would change the intended meaning, but that they could rather probe or repeat the question to dispel misunderstanding. In order to encourage a more complete response, the interviewer's task would be to probe or to determine whether the respondent has understood the question (Polit & Beck, 2004:365 and Uys & Basson, 2000:63);
- Field workers should not lead or guide respondents in answering the questions but assure them that there is no wrong or right answers;
- All answers should be recorded as they are expressed by the respondents' exact words without adding or deciding which information to write, especially with open ended questions;
- Field workers were informed that each question should be recorded immediately upon completion, as it would be precise. Uys and Basson (2000:64) indicated that if recording is deferred for some time, many of the finer details could be lost, and
- A hand shake or saying 'thank you' and 'good bye' will be enough to terminate the interview (no hugging as it might not be professional).

The researcher allowed field workers time to go through each question with them after training, as a measure of evaluating their understanding of each question. Training enabled gathering of accurate, valid and meaningful data that was maximally effective in answering research questions relevant to the study.

3.9.3 THE ACTUAL DATA COLLECTION PROCEDURE

The process that followed training was the actual data collection for the major study, which was done by trained field workers. Data collection commenced within two weeks after training in Thabo-Mofutsanyane, Lejweleputswa and Fezile Dabi whilst in Motheo; it was commenced within one week after training as the researcher was responsible for

facilitation of the data collection in Motheo. The procedure for data collection was as follows:

- Approved copies of the approval letters for conducting the study from the University of the Free State (UFS) Ethics Committee and Acting Head: Department of Health (DoH) as well as the questionnaires were duplicated and put into addressed A4 envelopes, posted or hand given to field workers of relevant hospitals (as indicated in Table 3.1 above), as proof that the study was legally approved by all relevant parties;
- Another envelope addressed with the researcher's contact details was sent with the questionnaire package to field workers. They could then put the completed questionnaires in the addressed envelope and post it back to the researcher;
- The Department of Health's (DoH) usual transport for delivering letters, which operates on a daily basis to collect and deliver back post from all the Free State Province Department of Health (DoH) public sector regional hospitals to Bophelo House, the DoH head office, was used for delivering the envelopes to the hospitals and brought back to the researcher at the Provincial Occupational Health Unit (POHU);
- The researcher and the field workers adhered to the code of ethics to obtain permission from the respondent's prior data collection. Explanation was done on the purpose of the investigation on reported needle stick injuries (NSIs) and how they (respondents) would benefit from the research;
- The researcher and field workers had contact details of respondents as the information was recorded on the injury on duty (IOD) register, which made it easy to trace and secure appointments for interviews;
- Appointments were made to secure a time and venue suitable for the respondents for interview to take place in privacy, where the information was recorded;
- There were unforeseen circumstances of unavailability of some HCWs for the interview, which was also aggravated by unavailability of three field workers from different hospitals, who were on study leave as well as those who took annual leave. Due to these circumstances the extension of the data collection period

was unavoidable (discussed in full in 3.5), and

- All completed questionnaires were posted back to the researcher by field workers, using Department of Health, Bophelo House mail.

3.9.4 THE TIME AND THE COST OF DATA COLLECTION

The time and cost of data collection is often inadequately estimated when planning a study. It was advisable to write out a time plan for the data collection period according to Burns and Grove (2005:455). The researcher wrote the plan for data collection with time frame and costs which changed as the study advanced. The events that interrupted data collection sometimes were not under the control of the researcher. Sometimes an appointment time was set but the respondents would not be present at the hospital. In such cases the researcher had to secure another appointment until the respondents were available. Cost of travelling was also affected by reasons which were out of the researcher's control. The time that was spent on an interview was in one case affected by a low level of education of the respondent and took longer than was anticipated. Time for collecting data differed, but was from 15-25 minutes per one respondent.

According to Burns and Grove (2005:456) the costs involved in a research study may be direct and indirect. There were direct costs in this study, for example hiring a typist, buying printer cartridges and consultation with experts for language editing. The indirect costs include travelling to and from the study site and costs for meals while working on the study. All of these costs were taken into account.

3.10 LIMITATIONS IN DATA COLLECTION

There were limitations in data collection in this study. The following were identified limitations:

- The extension of data collection time frame was due to unavailability of three field workers, from different hospitals. One was on study leave and two were on annual leave during extension of data collection period. To ensure validity and reliability on data collected, the researcher did not replace those field workers but had to wait until they were back on duty as they had been trained.

- The other delay in completing data collection within set timeframe was due to the type of injury received by two doctors which did not match the study inclusion criteria. One doctor was injured by a sharp theatre instrument and not a needle and the researcher excluded the doctor from the study. Another doctor was injured by a scalpel blade and was also excluded from the study. There was a need to get two doctors to replace those excluded, which caused another extension of the data collection time frame. Two doctors were replaced. The two doctors met the study inclusion criteria and both agreed to participate. They were both working in one hospital from Motheo district but were not accessible to be interviewed due to their work schedule (one working in theatre and one on night duty). After several attempts to find a suitable time to conduct the interview these doctors suggested to the researcher that the only option to enable their participation in the study was for the researcher to bring the questionnaire to their workplace and they would complete it themselves. There was thus a deviation from the planned procedure for conducting an interview, but due to the doctors' high level of education the researcher accepted the proposal made by these doctors to complete the questionnaires by themselves. The researcher hand delivered the questionnaires to the doctors at the workplace and collected on completion thereof.

3.11 DATA ANALYSIS

A staff member of the Biostatistics Department at the University of the Free State (UFS) processed the data. Descriptive statistics, namely, frequencies and percentages for categorical data, medians and percentiles for continuous data were calculated for all health care workers (HCWs) as well as per health care worker (HCW) category. The HCWs categories were compared by means of 95% confidence intervals (CI) or the Kruskal Wallis test for cases where small numbers occurred. Two way tables were calculated for each HCWs category and other relevant variables. Completed data was checked for errors prior to analysis and discussed with study leaders and a biostatistician.

Nominal measurements were done, which was assigning numbers to classify characteristics into categories according to Polit and Beck (2004:451). This means that, for example gender was assigned a one (1) for male and a two (2) for female. The numbers were merely symbols that represent two different values of the attribute gender. Data was also described in frequency distribution. A frequency distribution is a systematic arrangement of values according to Polit and Beck (2004:455) arranging from the lowest to the highest, together with a count of the number of times each value was obtained. The results with frequency distribution will be discussed in full in Chapter four (4).

The researcher was trained on how to code data by the biostatistician at the University of the Free State (UFS) who was responsible for the data analysis. Manual coding was done for all 100 questionnaires with each hospital's data coded separately. Coded questionnaires were given for data analysis which was done within a period of one month.

3.12 ETHICAL CONSIDERATION

According to Polit and Beck (2004:717) research ethics is defined as "...a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and social obligations to the study participants". Ethical consideration in research must apply to the individuals directly involved with the research but also to the people involved in carrying out the research (Uys & Basson, 2000:96).

There are several ethical research principles that should be considered when conducting research (Polit & Beck, 2004:143). Uys and Basson (2000:96) called these research ethical standards. The following research ethical principles or standards (Polit & Beck, 2004:143-154 and Uys & Basson, 2000:96-101) were followed by the researcher in this study namely:

3.12.1 FREEDOM FROM HARM

The researcher should minimize all types of harm (physical for example injury, emotional for example stress or fear, economical for example loss of wages). In this study, harm was avoided whereby the researcher gave the respondents freedom to participate in the research and to withdraw at anytime if he/she feels so. There was no wage loss because respondents were given freedom to decide on the time to be interviewed during their free time from work procedures.

3.13 BENEFIT FROM RESEARCH

A researcher should strive as far as possible to maximize benefits and to communicate potential benefits to respondents. Further it was indicated that no research should be undertaken if it is beyond the capabilities of the researcher. In this study the researcher and field workers communicated the benefits of the research to the respondents, prior to data collection, which was to investigate the reported NSIs in order to make recommendations to the department of health (DoH). The researcher is an employee of the Free State Province Department of Health (DoH) and placed at the Provincial Occupational Health Unit (POHU). One of the Provincial Occupational Health Unit's (POHU) strategic objectives (2005-2007:4-5) is to identify, conduct and support occupational health and safety related research in the Free State Province DoH.

3.13.1 PERMISSION AND INFORMED CONSENT

In the case of research to be conducted at a health care service facility and where patient's records are needed, permission for such research should be obtained from the authority in charge of the services. Written permission is essential as well as informed consent from the respondents. In this study, written permission was obtained from the Ethics Committee, Faculty of Health Sciences, University of the Free State (UFS). Approval for conducting the study in the Free State Province Department of Health (DoH) public health sector regional hospitals was obtained from the Acting Head of the Department of Health (DoH). There after signed copies of the approval letters (Ethics

committee and DoH), as proof that the researcher may conduct the study were sent to the Head of Clinical Support of each regional hospital that was included in the study. Study respondents were informed about these approvals (Ethics committee and DoH), copies made available to the respondents in order to gain their participation in the study as well as a proof that the research is conducted legally (approval letters attached in Annexure C). Informed consent was given verbally by the respondents to take part in the study.

3.13.2 TERMINATION

The individual respondent could choose to withdraw from the study, regardless of the fact that he/she initially agreed to participate. In this study the participation was voluntary and respondents were given freedom to withdraw from the study anytime they felt, or desired to do so.

3.13.3 CONFIDENTIALITY AND ANONYMITY

Confidentiality entails that no information provided by the respondents should be divulged or made available to another person. The researcher should ensure that the anonymity of any respondent or institution is protected in the report and that it is not possible to relate particular data to a particular respondent or institution. In this study the researcher ensured confidentiality and anonymity by assigning an identification number to each respondents and hospital used.

3.14 CONCLUSION

In this chapter a detailed description of the research methodology was given. Changes to the proposed methodology were identified and motivated, for example, the changes made in the questionnaire, time frame and data collection process. The quantitative research approach was used to determine the prevalence, incidence, size and measurable attributes of a phenomenon to test theory by using structured instruments (Uys & Basson, 2000:51), which was a questionnaire, in this study.

There was a need to acquire accurate interpretable data on reported needle stick injuries (NSIs) amongst health care workers (HCWs) of the Free State Province Department of Health (DoH) public health sector regional hospitals. Polit *et al*. (2001:40) and Burns and Grove, (2005:247) stated that to come up with research findings a plan or framework is needed. The conceptual framework used in this study was, needle stick injuries (NSIs), the practices of health care workers (HCWs) and the management of needle stick injuries (NSIs).

In chapter four (4) the results on reported needle stick injuries (NSIs) amongst health care workers (HCWs) of the Free State Province Department of Health (DoH) public health sector regional hospitals will be discussed.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 INTRODUCTION

In the previous chapter, a detailed description of the research methodology was given. The time frame, population and data collection process were discussed as well as changes made to the questionnaire. In this chapter the results on reported needle stick injuries (NSIs) amongst health care workers (HCWs) of the Free State Province Department of Health (DoH) public health sector regional hospitals will be discussed.

This chapter will further focus on data analysis and the discussion of the results, as supported by literature on needle stick injuries (NSIs). The literature has confirmed that there is a problem with needle stick injuries (NSIs) and associated illnesses amongst health care workers (HCWs), internationally, nationally and provincially.

The researcher considered the study objectives as discussed in chapter 1, in order that they should be met by the data analyses. The collected data from respondents was summarized and organized by the researcher with the guidance of a biostatistician at the department of biostatistics, University of the Free State (UFS) to ensure reliability in using descriptive statistics.

The discussion of the study results will accommodate two types of readers, as indicated by Bak (2003:38); those who scan through the text ignoring most of the tables and graphs and those who scan through figures in graphs and tables.

4.2 STUDY POPULATION

In this study the population which the researcher used was all the full time employed HCWs of the Free State Province Department of Health (DoH) public health sector regional hospitals who reported that they sustained NSIs from January 2006 to September 2007 as indicated in Table 3.1. These HCWs had to report to the Occupational Health Clinics (OHCs) for documentation of the injury on the Injury on

Duty (IOD) registers. The researcher used the entire accessible population of 105 HCWs (full description and changes made from the initial population in Chapter 3). These HCWs included 36 doctors, 30 professional nurses, 5 staff nurses, 15 auxiliary nurses, and 14 general assistants. Five HCWs, one from each HCWs category, formed part of the pilot study and their results were not included for data analysis. The distribution of the HCWs in each category is graphically displayed in Figure 4.1.

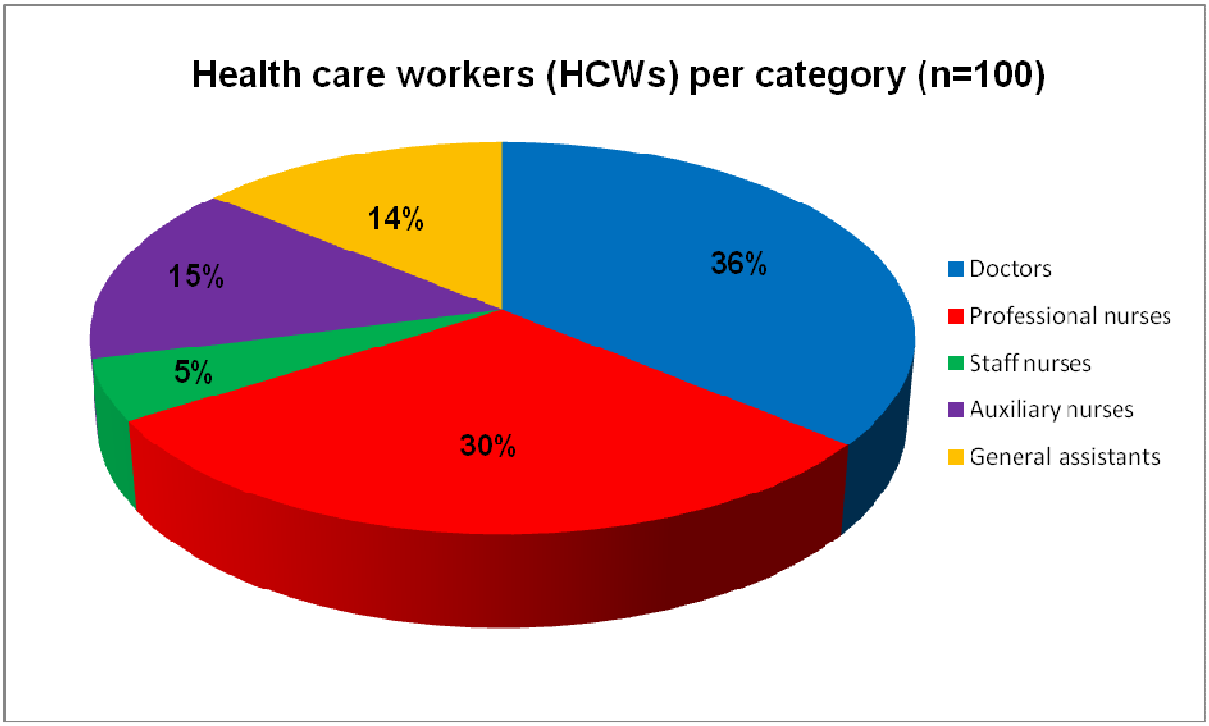


Figure 4.1: The distribution of health care workers (HCWs) according to each category (n=100)

4.3 DESCRIPTIVE STATISTICS

The definition provided by Polit *et al*. (2001:351), Polit and Beck (2004:451), as well as Burns and Grove (2005:795) stated that descriptive statistics enable the researcher to organize and synthesize data; examples include averages and percentages. Uys and Basson (2000:109) indicated that descriptive statistics are used for describing the collected data whereby information is sorted, arranged, and presented in a scientific manner.

The researcher sorted and arranged the 100 completed questionnaires. The questionnaire consisted of forty three questions. Twenty four closed-ended questions were coded by using the same numbers that were selected by the respondents. Nineteen open ended questions were categorized and coded. Categories were discussed with the study leaders and the biostatistician responsible for the data capturing.

4.4 STATISTICAL DATA ANALYSIS

A staff member of the Biostatistics Department at the University of the Free State (UFS) processed the data. Descriptive statistics, namely, frequencies and percentages for categorical data as well as medians and percentiles for continuous data were calculated for all health care workers (HCWs) as well as per health care worker (HCW) category. The HCWs categories were compared by means of 95% confidence intervals (CI) or the Kruskal Wallis test for cases where small numbers occurred. Two way tables were calculated for HCWs category and other relevant variables. Completed data was checked for errors prior to analysis and discussed with study leaders and a biostatistician.

4.4.1 STATISTICAL METHODS USED FOR DATA ANALYSIS

For all the sections descriptive statistics for categorical data and continuous data were calculated, for all the health care workers and per health care worker category. The results will follow the questionnaire layout in sequence. Results will be presented in tables, figures and sentences. If the data is categorical data it might be presented in a table or in a sentence depending on how much information is asked per question in the questionnaire. If data is continuous it will be presented in a sentence.

Categorical data are for example gender, namely male and female. The results state the frequency and percentage of each gender. For example there were 20 males which are 20 percent of the total sample, namely, 100 participants. Continuous data are for

example age. This was described by means of medians and percentiles. For example the minimum age was 20 years, the median was 39 years and the maximum age was 62 years. The median is the 50th percentile, meaning it is exactly in the middle

The categories were compared by means of 95% confidence interval (CI). The 95% confidence interval (CI) was calculated for the median difference and 95% confidence interval (CI) were calculated for the percentage difference. A confidence interval (CI) is a range of plausible values that accounts for uncertainty in a statistical estimate or put in another way the confidence interval (CI) gives a measure of the precision (or uncertainty) of study results for making inferences about the population of similar individuals. Confidence intervals (CI) combine information about the strength of an association with information about the effects of chance on the likelihood of obtaining the results. Confidence intervals (CI) place a clear emphasis on quantification of the effect, in direct contrast to the p-value approach (which arises from significance testing). Confidence intervals (CI) indicate the strength of the evidence about quantities that are directly relevant, such as treatment benefits. Confidence intervals (CI) are only significant if it does not include 0, so it can be either positive to a positive or negative to a negative. If confidence intervals are not significant you may look to see whether there is a tendency.

4.5 DISCUSSION OF RESULTS

The results are presented under the three main headings of the questionnaire, namely:

4.5.1 SECTION A: Information on needle stick injuries which consisted out of nineteen (19) questions.
4.5.2 SECTION B: Practices leading to needle stick injuries which had eight (8) questions.
4.5.3 SECTION C: Management of needle stick injuries consisted of sixteen (16) questions.

4.5.1 SECTION A: INFORMATION ON NEEDLE STICK INJURIES (NSIs) (n=100)

Section A of the questionnaire consisted out of nineteen (19) questions of which sixteen (16) were closed ended questions and three (3) open ended. The study results are as follows:

4.5.1.1 Gender of health care workers (HCWs) in each category: Frequency and percentage (n=100) 95% confidence interval for the female percentage difference (n=73)

The gender distribution of the studied HCWs who reported NSIs were 73% females in majority, opposed to 27% males. The gender distribution across the health care worker categories is shown in Table 4.1 below.

Table 4.1 Gender distribution of all health care workers (HCWs) categories: Frequency and percentage (n=100)

Categories of health care workers (HCWs)	Gender				
	Male n=27		Female n=73		Total percentage %
	f	%	f	%	
Doctors (n=36)	16	44.4	20	55.6	100%
Professional nurses (n=30)	3	10.0	27	90.0	100%
Staff nurses (n=5)	1	20.0	4	80.0	100%
Auxiliary nurses (n=15)	3	20.0	12	80.0	100%
General assistants (n=14)	4	28.6	10	71.4	100%

Out of the 100 HCWs in this study, the majority of females, (90%:n=27) who sustained NSIs were amongst professional nurses compared to female doctors (55.6%:n=20), auxiliary nurses (80.0%:n=12) and general assistants (71.4%:n=10). In the male category, doctors (44.4%:n=16) presented with needle stick injuries - the highest percentage, followed by general assistants (28.8%:n=4).

The results of the study are similar to the study done by Gershon, Sherman, Mitchell, Vlahov, Erwin, Lears, Felknor, Lubelczyk and Alter in 2007 (24–30). In their study out of 310 health care workers working in correctional settings in three different states in the United States (US), 73% females (226) as opposed to 27% males (84) reported significantly more exposure to NSIs. “The incidence rates of exposures were 8.9% HCWs per 100 hospital beds (95% confidence interval [CI], 8.7-9.0 exposures). 2.2% per 100 fulltime equivalent physicians (95% CI, 2.4-2.6 exposures) and 7.0% per 100 full-time-equivalent nurses (95% CI, 6.8-7.2 exposures)”.

The results obtained by Boal, Leiss, Sousa, Lynden, Li and Jagger (2008:213-222) in the study conducted at California, was also similar to the results obtained by the researchers in the above mentioned study namely, from a sample of 6,500, females (69%:n=4,500) reported significantly more exposure to NSIs than the 2 000 males (47%). Another study, conducted at Kathmandu Medical College and Teaching hospital, by Gurubacharya, Mathura and Karki (2003:91-94) indicated that of the 70 HCWs who reported NSIs, 59 (84%) were females and 11 (16%) were males. Gender distribution in a study done by Williams study done at Secondary hospital Metropolitan health district in Cape Town (2005:50), mentioned that out of nine respondents; eight were females and one male. Opposed to the previous findings is the study of Bohnker and Bowman (2005:1034-1036) who found that in a sample, of 265 medical personnel in Naval Center United States, 161 men (60.8%) reported the most needle stick injuries (NSIs).

Table 4.2 below indicates the female health care workers (HCWs) who sustained needle stick injuries (NSIs) using the 95% confidence interval for the percentage difference (n=73). The male differences were not discussed as shown in table 4.1 as it was not statistically significant for any of the categories since the confidence interval for the differences include zero.

Table 4.2: Female health care workers (HCWs) category who sustained needle stick injuries (NSIs): 95% confidence interval for the female percentage difference (n=73)

Categories of female health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-51.7:-12.9]*
Doctors *versus* Staff nurses	[-47.3:20.5]
Doctors *versus* Auxiliary nurses	[-45:4.8]
Doctors *versus* General assistants	[-39.1:14.2]
Professional nurses *versus* Staff nurses	[-12.6:52.9]
Professional nurses *versus* Auxiliary nurses	[-10.3:36.0]
Professional nurses *versus* General assistants	[-4.4:45.5]
Staff nurses *versus* Auxiliary nurses	[-44.4:30.0]
Staff nurses *versus* General assistants	[-37.1:39.4]
Auxiliary nurses *versus* General assistants	[-21.7:37.7]

* Statistical significant difference

There was a statistically significant difference in female distribution amongst doctors and professional nurses [-51.7:-12.9]. There are differences, though not statistically significant, between doctors and staff nurses [-47.3:20.5], doctors and general assistants [-47.3:20.5] as well as doctors and auxiliary nurses [-45:4.8].

Venier, Vincent, L'Hériteau, Floret, Sénéchal, Abiteboul, Reyreaud, Coignard and Parneix (2007:1196-1201), in their study done in 2007 on surveillance of occupational blood and body fluid exposures amongst a total of 375 French medical centers, 13,041 blood and body fluid exposures were reported, of which 10,656 were percutaneous injuries. “The incidence rates of exposures were 8.9% HCWs per 100 hospital beds (95% confidence interval [CI], 8.7-9.0 exposures), 2.2% per 100 fulltime equivalent physicians (95% CI, 2.4-2.6 exposures) and 7.0% per 100 full-time-equivalent nurses (95% CI, 6.8-7.2 exposures)”.

4.5.1.2 Age of health care workers (HCWs) categories who reported needle stick injuries (NSIs): Comparison of minimum, median, maximum and 95% confidence interval for the age percentage difference (n=90)

Table 4.3 below depicts the comparison of the minimum, median and maximum age distribution of HCWs. Only 90 HCWs who reported NSIs indicated their age of which the majority were aged 37 (7.78%:n=7) or 42 (7.78%:n=7) years of age respectively followed by 24 years (5,56%:n=5) or 25 years (5.56%:n=5).

Table 4.3: Age distribution amongst health care workers (HCWs) categories who sustained needle stick injuries (NSIs): Minimum, median and maximum (n=90)

Categories of health care workers (HCWs)	Minimum	Median	Maximum
All	20.0	39.0	62.0
Doctors (n=32)	22.0	29.0	42.0
Professional nurses (n=27)	29.0	43.0	60.0
Staff nurses (n=5)	23.0	45.0	53.0
Auxiliary nurses (n=12)	20.0	35.0	47.0
General assistants (n=14)	25.0	53.5	62.0

Ten (10) HCWs did not disclose their age of which 4 were doctors, 3 professional nurses and 3 were auxiliary nurses. Ethically the respondents cannot be forced to answer all the questions even if they agreed to participate in this study.

The minimum age of the ninety HCWs is 20 years (auxiliary nurse) and the maximum age is 62 years (general assistant). This is similar to the following studies: Gurubacharya, Mathura and Karki in 2003 (91-94) who reported that out of a total sample of 70 nurses and paramedical staff from different departments of a hospital, the majority 67 (96%), were aged between 20-40 years. Alam (2002:396) conducted a study on knowledge, attitude and practices amongst 104 Armed Force hospital HCWs in Sharourah, who sustained NSIs and indicated that the majority of 70 (67%) HCWs that included both nurses and paramedical staff were aged between 30-50 years. Hassan and Khalid (2001:401-407) reported in their study that of the 282 the mean age amongst female HCWs who sustained NSIs was 33:38 years (±7.78%) while male

HCWs was 35.97 years (±8.10%). A study done by Williams (2005:50) reported similar results in that the above mentioned studies as the results showed that the age group amongst 9 HCWs who sustained NSIs ranged from 24 years the youngest to 53 the oldest.

Table 4.4 depicts the mean age according to a 95% confidence interval for the age difference of HCWs who reported NSIs. There is a statistically significant difference in the median age between doctors and professional nurses [-17:-11], doctors and staff nurses [-22:-1], doctors and auxiliary nurses [-15:-1], doctors and general assistants [-27:-17]; professional nurses and general assistant [-12:-3]; staff nurses and auxiliary nurses [-22:-16] and lastly auxiliary nurses and general assistants [-29:-10].

Table 4.4: Age of all health care workers (HCWs) categories who sustained needle stick injuries (NSIs): 95% confidence interval for the age percentage difference (n=90)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-17:-11]*
Doctors *versus* Staff nurses	[-22:-1]*
Doctors *versus* Auxiliary nurses	[-15:-1]*
Doctors *versus* General assistants	[-27:-17]*
Professional nurses *versus* Staff nurses	[-8:13]
Professional nurses *versus* Auxiliary nurses	[-2:13]
Professional nurses *versus* General assistants	[-12:-3]*
Staff nurses *versus* Auxiliary nurses	[-22:-16]*
Staff nurses *versus* General assistants	[-20:1]
Auxiliary nurses *versus* General assistants	[-29:-10]*

* Statistical significant difference

Ten (10) HCWs did not disclose their age: 4 were doctors, 3 professional nurses and 3 were auxiliary nurses. Ethically the respondents cannot be forced to answer all the questions even if they agreed to participate in this study.

There are differences though, not statistically significant, between professional nurses and staff nurses [-8:13], professional nurses and auxiliary nurses [-2:13]; and lastly staff nurses and general assistants [-20:1].

Gershon *et al*. (2007:24–30) in a study done from 1999-2000 at a correctional service setting on the prevalence and risk factors for blood borne exposure and infection, amongst 310 participating correctional healthcare workers, found that the independent risk factors for experiencing percutaneous injuries included age; 45 or older (adjusted odds ratio [aOR], 2.41 [95% confidence interval (CI), 1.31-4.46]). Smith, Mihashi, Adachi, Nakashima, and Ishitake (2006:44-49) in their study found that nurses younger than 25 years of age were 2.18 times more likely to have sustained a single NSI in the past 12 months [odds ratio (OR) 2.18, 95% confidence intervals (CI) 1.15-4.17] and 2.39 times more likely to have sustained multiple NSIs (OR 2.39, 95% CI 1.08-5.34). This study was done on the epidemiology of needle stick and sharps injuries amongst nurses in a Japanese teaching hospital. The study found that of the 1,162 nurses from a large hospital in southern Japan (response rate 74.0%), forty-six percent had experienced a NSI in the previous year.

4.5.1.3 Different wards, units or departments where health care workers (HCWs) were currently working when NSI was sustained: Frequency and percentage of category of health care workers (HCWs) (n=100)

The results of the different wards, units or departments where health care workers (HCWs) were working when NSI was sustained are indicated in Figure 4.2 and table 4.5 below. Figure 4.2 indicates that the highest number (n=25) of HCWs indicated that they were working in other areas for example outpatient clinics, renal unit and psychiatric hospital. The second highest number of HCWs (n=14), were working in paediatrics (n=12) maternity and theatre respectively, as well as (n=11) medical wards and (n=10) casualty department.

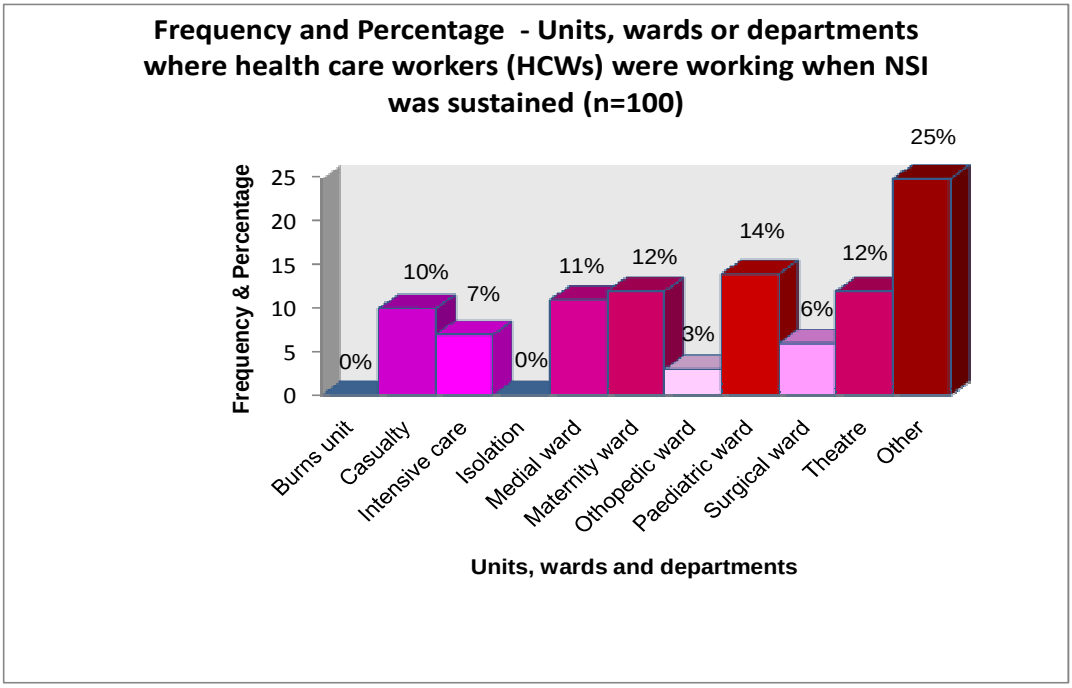


Figure 4.2: Wards, units or departments where health care workers (HCWs) were working when NSI was sustained: Frequency and percentage (n=100)

The lowest number of HCWs worked in orthopaedics (3%:n=3), followed by surgical wards (6%:n=6) then intensive care units (7%:n=7). No respondents indicated that they were working in the burns unit or the isolation unit. The highest number of HCWs (25%:n=25) were currently working in other departments, namely, outpatient departments, renal units and the psychiatric hospital.

Research studies indicate that the wards, units or departments of workplaces are also playing a role in exposing HCWs to NSIs. At exposure prone procedures performed in theatre, where general anaesthesia should be given, 75.9% out of fifty-four respondents 41 reported NSIs in Victoria, Australia (Trasancos, Kainer, Desmond & Kelly, 2001:241-244). Hassan and Khalid (2001:401-407) however reported that, a population of 282 respondents in Saudi Arabia, indicated that the highest percentage 48.5% of NSIs (137) were in the general wards namely medical- and surgical wards, followed by 17.7% intensive care and dialysis units (50); then 15.6% theatre (44) and lastly the 13.8% accident– and emergency departments (39).

The results of the different categories of HCWs working in the different wards, units or departments are indicated in Table 4.5 below.

Table 4.5: Different wards, units or departments where health care workers (HCWs) category were currently working when NSI was sustained: Frequency and percentage (n=100)

Wards, units or departments where health care workers (HCWs) worked	Doctors n=36		Professional nurses n=30		Staff nurses n=5		Auxiliary nurses n=15		General assistants n=14	
	f	%	f	%	f	%	f	%	f	%
Casualty department	7	19.4	1	3.3	1	20.0	1	6.7	0	0.0
Intensive care unit	2	5.6	2	6.7	0	0	0	0	3	21.4
Medical ward	2	5.6	1	3.3	2	40.0	4	26.7	2	14.3
Maternity ward	3	8.3	6	20.0	0	0	3	20.0	0	0
Orthopaedic ward	2	5.6	0	0	0	0	0	0	1	7.1
Paediatric ward	5	13.9	5	16.7	1	20.0	3	20.0	0	0
Surgical ward	3	8.3	1	3.3	0	0	1	6.7	1	7.1
Theatre	9	25.0	3	10.0	0	0	0	0	0	0
Other clinics: renal unit and psychiatric complex	3	8.3	11	36.7	1	20.0	3	20.0	7	50.0

Most doctors (25%:n=9) were working in theatre followed by casualty (19%:n=7). Most professional nurses (36.7%:n=11) indicated “other” areas, followed by maternity (20%:n=6) and paediatric ward (16,7%:n=5). No staff nurses, auxiliary- or general assistants sustained NSIs in theatre. Wicker, Jung, Allwinn, Gottschalk and Rabenau (2008:347-354) indicated that all HCWs are exposed to job-related risk factors such as needle stick injuries. Of all occupational groups, 55.1% physicians 129 out of (234) had the highest risk of needle stick injuries. Their study also revealed that a wide variation in the number of reported NSIs was evident across 46.9% HCWs ranging from (91-194) amongst medical staff in surgery and 18.7% paediatrics (53-283).

In another study done by Alamgir, Cvitkovich, Astrakianakis, Yu and Yassi (2008:12-21) in British Colombia in Canada, they indicated that out of a total of 21,617 HCWs across all health care settings, 388 HCWs sustained NSIs whereas the others were injured by sharps or had body fluid and blood splashes. The areas where HCWs sustained NSIs were in the following areas: 84.5% acute care 328, 7.2%, community care 28 and 8.2% long-term care 32. Of all the NSIs across the health care settings, 51.3% occurred at the patient's bedside opposed to 40.5% in the patient's room and 10.8% in the ward/unit. The specific location where NSIs occurred included 40.5% patient rooms (157), 10.8% ward/unit (42), 9.8% operating rooms (38), 8.2% emergency departments (32), intensive 4.4% care units (17), 6.7% laboratory rooms (26), 9.0% treatment rooms (35), 1.5% infection control (6), 3.6% unspecified areas (14) and 5.4% other areas such as dining room, common room, hallway, and others (21).

Smith, Smyth, Leggat and Wang (2006:71-77) on the other hand, in their study on needle stick and sharps injuries amongst nurses 287 in a tropical Australian hospital found that only 76.7% nurses completed the questionnaire. Eighty one nurses who sustained NSIs and sharps injuries worked in the medical wards 36.8% whereas 71 nurses worked in the surgical wards (32.3%) and 68 in the maternity/neonatal wards (30.9%).

4.5.1.4 Months worked by the different health care workers (HCWs) categories in the wards, units or departments: Minimum, median, maximum and 95% confidence interval for the percentage difference (n=95)

The length of stay in the wards, units or departments where HCWs were working was calculated in months as depicted in Table 4.6 below. The longest period of 360 months (30 years) working in the ward was indicated by one general assistant, while one doctor worked for less than a month (0.0083) and the other four doctors had worked for less than 6 months when they sustained needle stick injuries (NSIs).

Table 4.6: Months worked in the wards, units or departments by different health care workers (HCWs) categories: Minimum, median and maximum (n=95)

Categories of health care workers (HCWs)	Minimum	Median	Maximum
	0.0083	24.0	360
Doctors (n=35)	0.0083	6.0	120
Professional nurses (n=26)	2.0	84.0	216
Staff nurses (n=5)	10.0	84.0	120
Auxiliary nurses (n=15)	1.0	9.0	132
General assistants (n=14)	2.0	42.0	360

Five (5) professional nurses were unable to recall their length of stay.

The lowest median length of stay was indicated as follows: doctors 6 months, auxiliary nurses 9 months and general assistants 42 months. Both professional- and staff nurses' median length of stay were 84 months. The median months worked in the wards, units or departments by all different categories of health care workers (HCWs) were 24 months while the maximum were 360 months.

These results are similar to the results obtained in a study conducted by Williams (2005:50) where the population of the study was nine (9). Seven out of the nine HCWs included in the study were employed for longer than two years when the injury occurred, while the range of employment was between 1-20 years. On the other hand Janjua, Razaq, Chandir, Rozi and Mahmood (2007:1474) reported that in first care level facilities in two districts of Pakistan, on average the HCWs worked for 9.6 years in the same area when they sustained NSIs. Hassan and Khalid (2001:401-407) reported that out of 282 respondents, 50% of the HCWs were injured in the first 3 years of their employment. Gurubacharya *et al*. (2003:91-94) are to the same conclusion as the above mentioned authors and indicated that out of the 70 HCWs at Kathmandu medical college, 54 (77%) HCWs worked for less than 5 years when they sustained NSIs. De Graaf, Houweling and Van Zessen (1998:441-452), as cited in Moody's study (2002:1-152), pointed that out of a group of 99 Dutch doctors who visited South Africa for a period of twenty-one months (less than two years), 60 (61%) reported NSIs during their stay.

Table 4.7 indicates that there is a statistically significant difference in the median length of stay between doctors and professional nurses [-102:-33], doctors and staff nurses [-93:-7], doctors and general assistants [-71:-11], professional nurses and auxiliary nurses [12:103] as well as auxiliary nurses and general assistants [-75:-6].

Table 4.7: Months worked in the wards, units or departments by different health care workers (HCWs) category calculated for the median length of stay: 95% confidence interval for the percentage difference (n=95)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-102:-33]*
Doctors *versus* Staff nurses	[-93:-7]*
Doctors *versus* Auxiliary nurses	[-8:5]
Doctors *versus* General assistants	[-71:-11]*
Professional nurses *versus* Staff nurses	[-48:84]
Professional nurses *versus* Auxiliary nurses	[12:103]*
Professional nurses *versus* General assistants	[-24:70]
Staff nurses *versus* Auxiliary nurses	[-2:93]
Staff nurses *versus* General assistants	[-74:72]
Auxiliary nurses *versus* General assistants	[-75:-6]*

* Statistical significant difference
Five (5) professional nurses were unable to recall their length of stay.

There are differences, though not statistically significant between doctors and auxiliary nurses [-8:5], professional nurses and staff nurses [-48:84], professional nurses and general assistants [-24:70], staff nurses and auxiliary nurses [-2:93] and lastly staff nurses and general assistants [-74:72]. There were five (5) missing values due to professional nurses who could not recall their length of stay.

Erdem and Talas (2006:208-214) in their study on blunt and penetrating object injuries in housekeepers working in a Turkish University Hospital found amongst 402 housekeepers working in patient care services, the mean length of employment was 3.2

years. Sixty-two point nine percent (62.9%) of them were working in either medical or surgical units whereas 88.8% of them were working in routine cleaning.

4.5.1.5 Categories of Health care workers (HCWs) who sustained needle stick injuries (NSIs) within less and more than six months of employment: Frequency and percentage and 95% confidence interval for the percentage difference (n=95)

The categories of health care workers (HCWs) who sustained needle stick injuries (NSIs) within less (n=23) and more than six months (n=73) of employment is shown in Table 4.8 below.

Table 4.8: Categories of health care workers (HCWs) who sustained needle stick injuries (NSIs) within less and above six months of employment: Frequency and percentage (n=95)

Categories of health care workers (HCWs)	Less than 6 months (n=23)		More than 6 months (n=73)	
	f	%	f	%
Doctors (n=36)	16	45.7	19	54.3
Professional nurses (n=26)	1	3.8	25	96.2
Staff nurses (n=5)	0	0.0	5	100.0
Auxiliary nurses (n=15)	5	33.3	10	66.7
General assistants (n=14)	1	7.1	13	92.9

Four (4) professional nurses and one (1) doctor could not recall their length of stay in the ward, unit or departments when they sustained NSIs.

Out of the 100 HCWs in this study, doctors (45.7%:n=36) who were employed less than six months, sustained the highest number of NSIs, followed by auxiliary nurses (33.3%:n=15), Similar, staff nurses (100.0%:n=5) who were employed for longer than six months, sustained the most NSIs, followed by professional nurses (54.3%:n=26) then doctors (54.3%:n=36), general assistants (92.9%:n=14) and auxiliary nurses (66.7%:n=15).

Hassan and Khalid (2001:401-407) in their study done in hospitals from the Eastern Province of Saudi Arabia, amongst 282 respondents, showed that 50% of NSIs

occurred in the first three (3) years of employment. According to them, the mean duration of experience of injured males (5.06±4.74 years) is significantly higher than that of injured females (4.40±3.67 years). In another study conducted at the Christian Medical College in India, Jayanth, Kirupakaran, Brahmadathan, Gnanaraj and Kang (2009:44-47) researched needle stick injuries (NSIs) in a 2,234 bed tertiary care hospital. During the period July 2006 to June 2007, the 296 HCWs who reported NSIs were 84 (28.4%) nurses, 27 (9.1%) nursing interns, 45 (21.6%) cleaning staff, 64 (21.6%) doctors, 47 (15.9%) medical interns and 24 (8.1%) technicians. Amongst the 296 HCWs a total of 147 (49.7%) who reported NSIs had working experience of shorter duration than one (1) year.

4.5.1.6 Categories of health care workers (HCWs) who sustained needle stick injuries (NSIs) within less than six months of employment: 95% confidence interval for the percentage difference (n=23)

There is a statistically significant difference in the length of stay amongst HCWs who sustained NSIs within less than six months of employment between doctors and professional nurses [20.4:58.3], doctors and general assistants [9.9:55.7] and professional nurses and auxiliary nurses [-54.6:-5.9] as shown in Table 4.9 below.

Table 4.9: Categories of health care workers (HCWs) who sustained needle stick injuries (NSIs) within less than six months of employment: 95% confidence interval for the percentage difference (n=23)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[20.4:58.3]*
Doctors *versus* staff nurses	[-0.3:61.8]
Doctors *versus* Auxiliary nurses	[-16.9:36.6]
Doctors *versus* General assistants	[9.9:55.7]*
Professional nurses *versus* staff nurses	[-39.7:18.9]
Professional nurses *versus* Auxiliary nurses	[-54.6:-5.9]*
Professional nurses *versus* General assistants	[-27.8:12.9]
Staff nurses *versus* Auxiliary nurses	[-58.3:13.8]
Staff nurses *versus* General assistants	[-31.5:36.7]
Auxiliary nurses *versus* General assistants	[-4.2:51.8]

* Statistical significant difference

There are differences though not statistically significant between doctors and staff nurses [-0.3:61.8], doctors and auxiliary nurses [-16.9:36.6], professional nurses and staff nurses [-39.7:18.9], professional nurses and general assistants, [-27.8:12.9]. Staff nurses and auxiliary nurses [-58.3:13.8], staff nurses and general assistants [-31.5:36.7] and lastly auxiliary nurses and general assistants ([4.2:51.8].

Jayanth, Kirupakaran, Brahmadathan, Gnanaraj, and Kang (2009:44-47) investigated accidental needle stick injuries (NSIs) in a tertiary care hospital in India with a view to determine risk factors for NSIs. A review was done on a total of 296 HCWs who have reported NSIs over a period of one (1) year from July 2006-June 2007. Out of 296 HCWs who reported NSIs, 147 (49.7%) had a work experience of less than 1 year ($P <$ 0.001). The study population included 84 nurses (28.4%), 27 nursing interns (9.1%), 45cleaning staff (21.6%), 64 doctors (21.6%), 47 medical interns (15.9%) and 24 technicians (8.1%).

4.5.1.7 Training of health care workers (HCWs) categories in the type of work done during needle stick injuries (NSIs): Frequency and percentage (n=99)

The study results as depicted in table 4.10 revealed that out of 99 HCWs (94%:n=94) were trained while (5%:n=5) indicated that they were not trained in the type of work performed while they sustained NSIs. All 36 doctors, professional (30) and staff nurses (5) indicated that they were trained for the type of work performed when they sustained NSIs. One general assistant did not respond to the question.

Table 4.10: The different health care workers (HCWs) category who were trained and not trained in the type of work they performed when a needle stick injuries (NSIs) occurred: Frequency and percentage (n=99)

Categories of health care workers (HCWs)	Trained n=94		Not trained n=5	
	f	%	f	%
Doctors (n=36)	36	100.0	0	0.0
Professional nurses (n=30)	30	100.0	0	0.0
Staff nurses (n=5)	5	100.0	0	0.0
Auxiliary nurses (n=15)	11	73.33	4	26.67
General assistants (n=14)	12	92.31	1	7.69

One (1) general assistant did not respond to this question.

The five HCWs that indicated that they were not trained, included auxiliary nurses (26.67%:n=4) and general assistants (7.69%:n=1). Several studies indicated a reduction of NSIs after training of health care workers was done. A study done by Valls, Lozano, Yanez, Martinez, Pascual, Lloret and Ruiz (2007:1352-1360) on the use of safety devices and the prevention of percutaneous injuries amongst Virgen de la Salud-Elda; Alicante, Spain hospital healthcare workers, revealed that education and training contributed to the reduction in NSIs. An ongoing educational program on percutaneous injury was started from 2002. This was followed by a three hour intervention course in 2005-2006 using engineered devices, which had a two hour "hands-on" training session. There was a 93% reduction in the relative risk of percutaneous injuries in areas where safety devices were used. While in the wards or units where the intervention was not implemented, the percutaneous injuries rates remained stable.

Yang, Liou, Chen, Yang, Wang, Chen and Wu (2007:424-429) did a study to assess the effectiveness of a training program on reduction of NSIs and sharp object injuries amongst 107 nursing students in Southern Taiwan during their internship rotation.
In this study they used pre-test questionnaires completed by all students and post-test questionnaires after work experience as licensed nurses to assess the effectiveness of

the intervention. After educational intervention, the incidence of NSIs/SIs decreased significantly from 50.5% (54) pre-test to 25.2% (27) post-test, and the report rate increased from 37.0% to 55.6%, respectively.

4.5.1.8 Categories of Health care workers (HCWs) who sustained needle stick injuries (NSIs): Frequency and percentage (n=100)

In this study, out of 100 respondents, the majority of HCWs who sustained NSIs were doctors (36%), followed by professional nurses (30%), auxiliary nurses (15%) and general assistants (14%), while the lowest category of HCWs were staff nurses (5%) as indicated in figure 4.3.

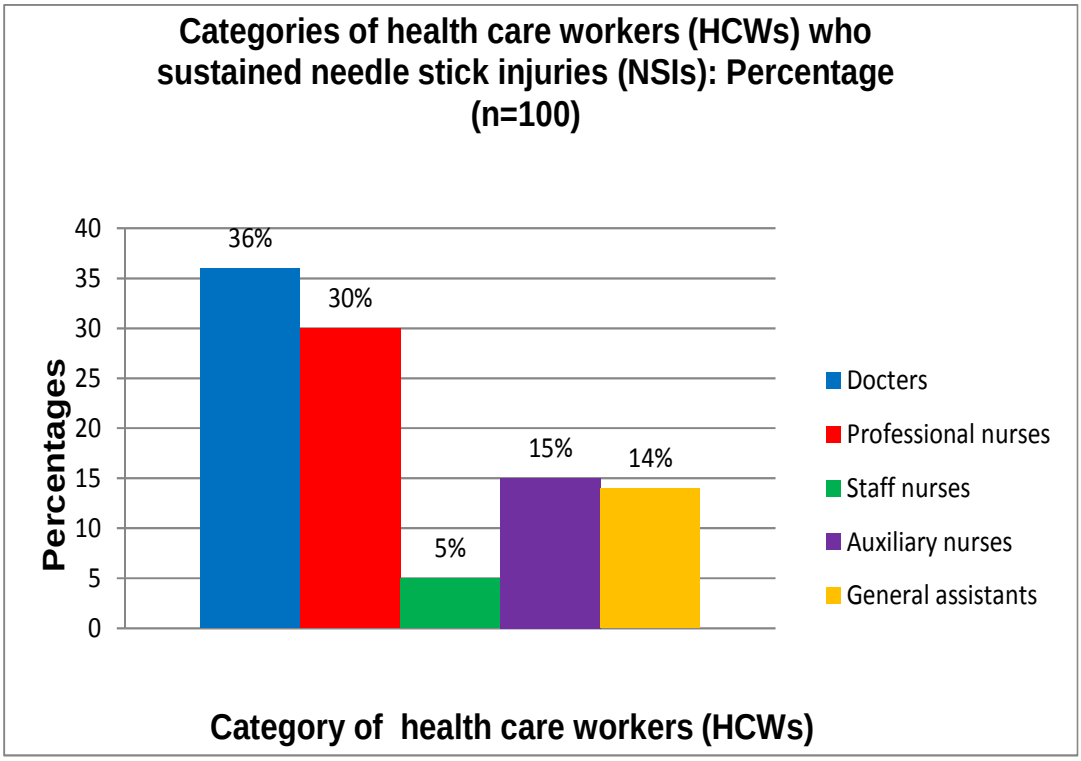


Figure 4.3: Categories of health care workers (HCWs) category who sustained needle stick injuries (NSIs): Frequency and percentage (n=100)

Peng, Tully, Boss and Hiller (2008:139-147) have done a study on sharp injuries and body fluid exposure amongst health care workers (HCWs) in a 1000-bed Australian

Tertiary Hospital. They did a descriptive epidemiological study between the years 2000 and 2003 using surveillance data of all reported sharps injuries and body fluid exposures. A total of 640 sharps injuries and body fluid exposures were reported from hospital and non-hospital staff. Nurses (47%:n=356) reported the highest incidents of NSIs followed by doctors (28%:n=182) and non medical staff (9%:n=29). Jayanth *et al*. (2009:44-47) reported similar results as the above mentioned results. In their study, at a tertiary hospital, on needle stick injuries over a five year period, they found that of the 296 HCWs reporting NSIs, 84 (28.4%) were nurses, 64 (21.6%) doctors, 47 (15.9%) medical interns, 45 (21.6%) were cleaning staff, 27 (9.1%) were nursing interns and 24 (8.1%) technicians. Nursing and medical interns were a significantly larger proportion of staff sustaining NSIs (P<0.001).

4.5.1.9 The year in which health care workers (HCWs) received their last Hepatitis B immunization: Frequency and percentage (n=89)

Investigation regarding the Hepatitis B immunization status of HCWs was done whereby the last year in which HCWs were immunized against Hepatitis B (figure 4.4) was assessed. In this study HCWs (21.35%:n=19) had their last immunization in the year 2007, followed by (15.7%:n=14) from 2004 to 2006, (9%:n=8) HCWs were vaccinated in 2002, (6.7%:n=6) in 2003, (5.6%: n=5) in 2001, while (2.25%:n=2) HCWs had their last immunization in the year 2000, 2008, and 1998.

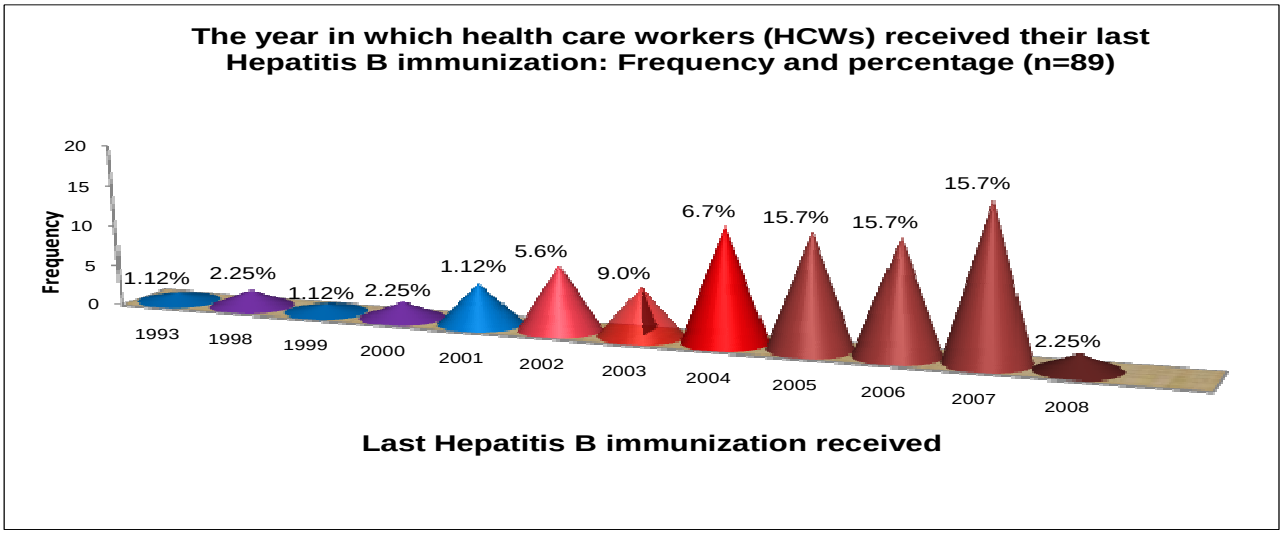


Figure 4.4: The year in which health care workers (HCWs) received their Hepatitis B immunization: Frequency and percentage (n=89)

Lastly in 1993, 1998 and 1999 only one (1.12%:n=1) had their last Hepatitis B immunization. Eleven HCWs, doctors (3), professional nurses (3), staff nurse (1), auxiliary nurses (3) as well as one general assistant did not answer this question as they could not recall when last they had received Hepatitis B immunization. Gershon *et al.* (2007:24-30) did a study amongst 310 participants in three (3) participating state correctional systems (Rhode Island, Texas, & Maryland) on the prevalence and risk factors for blood borne exposure and infection. In correctional health care workers 222 (72%) reported that they received a primary hepatitis B vaccination series. Of these, 150 (68%) tested positive for anti-hepatitis B surface antigen. All negative results significantly associated with vaccination of last the dose more than 5 years previously.

Saberifiroozi, Gholamzadeh and Serati (2006:204-207) conducted a study to investigate the long-term immunity amongst health care workers vaccinated against hepatitis B virus in a large referral hospital in Southern Iran between February 2003 and March 2004. A total of 339 out of 600 health care workers (HCWs) agreed to participate in the study. Health care workers (HCWs) were asked to respond to all the questions regarding their age, gender, date of hepatitis B vaccination and the number of doses of

vaccine, their job description in hospital and their previous history of needle stick injury (NSI). All 339 HCWs who were willing to participate had three doses of hepatitis B vaccine. Two hundred and seventy three (273) HCWs were vaccinated less than 5 years, 47 between 5 and 10 years, and 19 were vaccinated more than 10 years prior to the interview.

4.5.1.10 First exposures of Health care workers (HCWs) to needle stick injuries (NSIs) per category: Frequency and percentage and 95% confidence interval for the percentage difference (n=100)

According to the results tabled in Table 4.11, auxiliary nurses (86.7%:n=13) in this study experienced the highest first exposure to needle stick injury (NSI). Exposure of professional- and staff nurses to NSIs ranged between (63.3%:n=19) and (60%:n=3) respectively. General assistants first exposure was (57.1%:n=8) and doctors first exposure was (50%:n=18).

Table 4.11: First exposure to a needle stick injury (NSI) per health care worker (HCW) category: Frequency and percentage (n=100)

Categories of health care workers (HCWs)	Yes (n=61)		No (n=39)	
	f	%	f	%
Doctors (n=36)	18	50.0	18	50.0
Professional nurses (n=30)	19	63.3	11	36.7
Staff nurses (n=5)	3	60.0	2	40.0
Auxiliary nurses (n=15)	13	86.7	2	13.3
General assistants (n=14)	8	57.1	6	42.9

Thirty nine HCWs sustained more than one NSI. Half of the doctors (50%n=18), followed by general assistants (42.9%:n=6) and professional nurses (36.7%:n=11), as well as staff- (40%:n-2) also sustained NSIs; the lowest number were auxiliary nurses (13.3%:n=2).

Gańczak, Milona and Szych (2006:175-180) did a research study amongst 601 nurses on occupational exposures to blood borne viruses (BBV) in surgical wards, operating rooms, and emergency departments in Poland. Out of the 601 nurses, those who never

had exposures [zero (0)] to BBV or previous exposures were 72.5% (436), while 27.5% reported first exposure (165) already had one (1) previous exposure to blood borne viruses (BBV). Alam (2002:396-399) in a study conducted on the knowledge, attitudes and practices amongst health care workers (HCWs) of the Armed Force hospital in Sharourah needle stick injuries (NSIs) A total survey of 104 health care workers, which included, seventy nurses and 67% paramedical staff from different departments/wards of the hospital. Eighteen (26%) nurses of the never had previous exposure to NSIs, while fifty two (74%:n=52 of 70) did have previous NSIs.

The comparison for the 95% confidence interval for the difference in percentages of HCWs who sustained NSIs for the first time is shown in Table 4.12. There is a statistically significant difference [-54.9%:-7.6%] in the percentages of HCWs who sustained NSIs for the first time between doctors and auxiliary nurses. There are also differences, though not statistically significant, between other HCWs categories.

Table 4.12: Health care workers (HCWs) who sustained needle stick injuries (NSIs) for the first time in each category: 95% confidence interval for the percentage difference (n=61)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-34.8%:10.3%]
Doctors *versus* staff nurses	[-42.2%:30.1%]
Doctors *versus* Auxiliary nurses	[-54.9%:-7.6%]*
Doctors *versus* General assistants	[-33.6%:21.9%]
Professional nurses *versus* staff nurses	[-30.1%:43.1%]
Professional nurses *versus* Auxiliary nurses	[-43.6%:5.3%]
Professional nurses *versus* General assistants	[-21.7%:34.9%]
Staff nurses *versus* Auxiliary nurses	[-64.8%:10.8%]
Staff nurses *versus* General assistants	[-39.9%:40.3%]
Auxiliary nurses *versus* General assistants	[-3.1%:55.9%]

* Statistical significant difference

Askarian, Shaghaghian and McLaws (2007:988-992) performed a study on needle stick injuries amongst nurses of Fars Province, in Iran. Questionnaires were distributed in 52 hospitals to a stratified random sample of 2 118 (46.3%) nurses between April and September 2005 to collect self-reported NSIs in the previous 12 months. Of the 2 118 nurses, 1 555 returned a completed questionnaire; 49.6% (95% confidence interval [95 CI] 47.1%-52.1%) recalled at least one sharps injury, of which 52.6% were classified as NSIs. Just over one fourth, namely, 409 (26.3%) out of 1 555 (95 CI 24.1%-28.6%,) of respondents sustained at least one NSI.

In another study conducted in 2005 by Ebrahimi and Khosravi (2007:56-62) at a 313 bed public teaching hospital Shahroud City, in Imam Hossein, out of 183 nurses, there were 114 who indicated that they experienced one needle stick injury (NSI). This was an incidence rate of 63.3% (0.95 CI: 56.3- 70.3) for one year.

4.5.1.11 Number of needle stick injuries (NSIs) per health care worker (HCW) category: Cases (Occurrence) (n=80)

In this study, eighty HCWs indicated that they had more than one NSI. The occurrence of NSIs as shown in cases of NSIs per category of HCW is indicated in Table 4.12 below. Case 1 - 6 means that after HCWs sustained their first NSI, they sustained another one or more injuries.

Table 4.13: Number of needle stick injuries (NSIs) per health care worker (HCW) category: Cases (Occurrence) (n=80)

Cases (occurrence)	Doctors (n=36)	Professional nurses (n=30)	Staff nurses (n=5)	Auxiliary nurses (n=15)	General assistants (n=14)	Total
Case 1	18	10	2	4	4	38
Case 2	15	7	1	2	5	30
Case 3	4	3	0	0	1	8
Case 4	1	2	0	0	0	3
Case5	0	1	0	0	0	1
Case 6	0	0	0	0	0	0
Total	38	23	3	6	10	80

Doctors (n=18) experienced a 2nd needle stick injury (case 1), 15 sustained a 3rd NSI (case 2) and 4 doctors a 4th NSI (case 5). Within the professional nurse category, 10 sustained a 2nd NSI (case 1), where as 7 sustained a 3rd NSI (case 2). Three professional nurses sustained a 4th NSI (case 3), 2 a 5th NSI (case 4) and 1 sustained a 6th NSI (case 5). Within the other categories, 2 staff nurses, 4 Auxiliary nurses and 4 general assistants, each sustained a second NSI (case 1), there were those who sustained up to 3 NSI as well as those that sustained 2 NSI. In all HCWs categories, a total of 38 had a second exposure, 30 had a third, while 8 had a fourth, 3 had a fifth and 1 had a sixth exposure to NSIs.

Gańczak, Milona and Szych (2006:175-180) conducted a study amongst 601 nurses regarding occupational exposures to blood borne viruses (BBV) from surgical wards, operating rooms, and emergency departments in Poland. Out of 601 nurses surveyed almost half of the respondents (45.9%:n=276 of 601) recorded on the questionnaire as having had at least one (1) NSI during the past year while treating their patients (median, 2 punctures). A total of 79% (218) had 1-5 puncture exposures 11.2% (31) had 6-10 puncture exposure and 9.8% (27) had more than 10 NSIs. Alam (2002:396-399) carried out a study at the Armed Forces in a 100 bed Hospital, in Sharourah, to investigate the knowledge, attitudes and practices amongst health care workers (HCWs) on needle stick injuries (NSIs) in January 2002. Of a total of 104 health care workers (HCWs), 67%, (70) of the study population, consisted of nurses and paramedical staff, from different departments/wards of the hospital. The frequency of NSIs, 35% (67) was 1-2 per year, 29% (15) respondents sustained 3-4 NSIs and 4% (2) respondents sustained 5-6 NSIs.

Askarian, Shaghaghian, McLaws (2007:988-992) performed a study on needle stick injuries (NSIs) amongst 2 118 nurses of the Fars Province in Iran. Of the 1 555 respondents just over one fourth 26.3% (409) (95 CI 24.1% 28.6%) of respondents sustained at least one NSI, while 75.6% (95 CI 71.1%-79.6%) recalled having sustained between 1 to 4 injuries in the past 12 months. Considering only the category of doctors, Makary, Al-Attar, Holzmueller, Syin, Gilson, Sulkowski, and Pronovost (2007:2693-2699) undertook a survey which included 700 surgical residents in-training in 17

different United State medical centres and found that 99% (699) respondents suffered an average of eight NSIs in their first five years of training. Most of the exposures, mainly 83% (582) occurred as a result of NSIs.

4.5.1.12 Distribution of the occurrences of needle stick injuries (NSIs) according to year per health care worker (HCW) category from 1986 – 2007: Percentage (n=80)

Figure 4.5 shows the distribution of the occurrence of needle stick injuries (NSIs) for all health care workers (HCWs) categories from the year 1986 to 2007. These exposures were more than once. In general, the occurrence of NSIs increases sharply from 2005 to 2007.

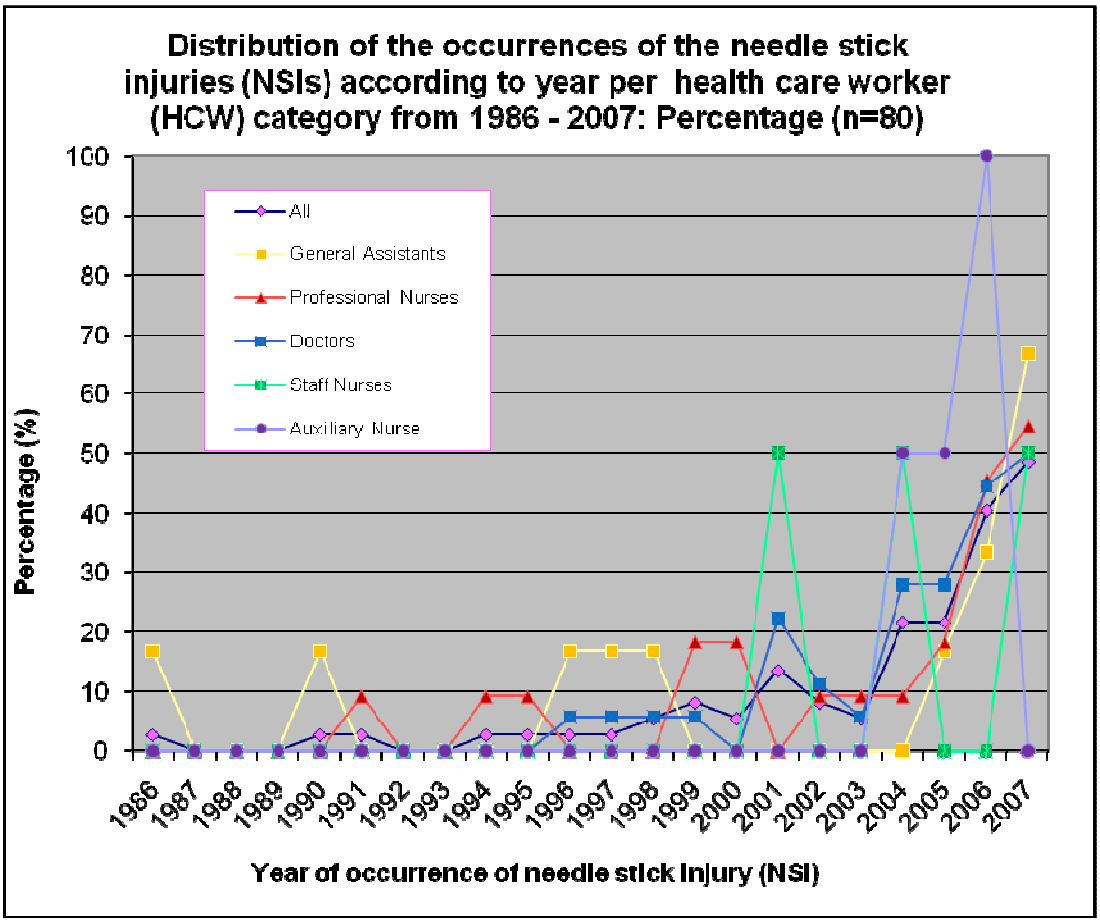


Figure 4.5: Distribution of the occurrences of the needle stick injuries (NSIs) according to year per health care workers (HCWs) category from 1986 – 2007: Percentage (n=80)

General assistants had the greatest number of exposure to NSIs for the year 2007, (66.7%:n=4), followed by professional nurses (54.5%:n=6), doctors were (50%:n=9) and staff nurses (50%:n=1). In the year 2005 the reported NSIs amongst auxiliary nurses were (50%:n=1), doctors (27.8%: n=5), professional nurses (18.2%:n=2) and general assistants (16.7%:n=1). On the other hand in 2006 professional nurses reported (45.4%:n=5) NSIs, doctors (44.4%:n=8) and general assistants (33.3%:n=2). The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations No. 1995 (RIDDOR) (2005:Online), as published at the Royal College of Nursing, about "Good Practice in Infection Prevention and Control Guidance for Nursing Staff" London, indicates that the incidents involving needle-sticks injuries (NSIs) from the year 2004-2005 over 3 days, constituted a total of 61 out of 156 000 incidents.

Saulat (2005:233–238) also assessed the epidemiology of needle stick injuries (NSIs) amongst health care workers (HCWs) in a 212-bed secondary care hospital in Saudi Arabia for the period January 2002 to December 2003. A retrospective 2 year period survey of 73 self-reported documented related NSIs were analyzed. The study results revealed that out of 73, the category of HCWs involved were nurses (66%), physicians (19%), technicians (10%), and non clinical support staff (5.5%).

4.5.1.13 Time of the last occurrence of needle stick injuries (NSIs) across the health care workers (HCWs) category: Percentage (n=100) and 95% confidence interval for the percentage difference (n=100)

The distribution of the time of occurrence of the last NSI sustained across the HCWs categories is shown in Figure 4.6. Most of the NSIs amongst doctors (32.35%:n=11) occurred between 11:00 and 13:00, whereas auxiliary nurses (38.46%:n=5) sustained NSIs respectively between 07:00 and 10:00 and 11:00 and 13:00. NSIs sustained by Professional nurses (37.93%:n=11) and general assistants (71.43%:n=10) occurred mostly between 07:00 and 10:00. Staff nurses (40.0%:n=2) on the other hand sustained NSIs mostly during 07:00-10:00 and 14:00-19:00 no NSIs were reported between 19:00-23:00. Doctors and general assistants did not report any injuries sustained between 23:00-06:00.

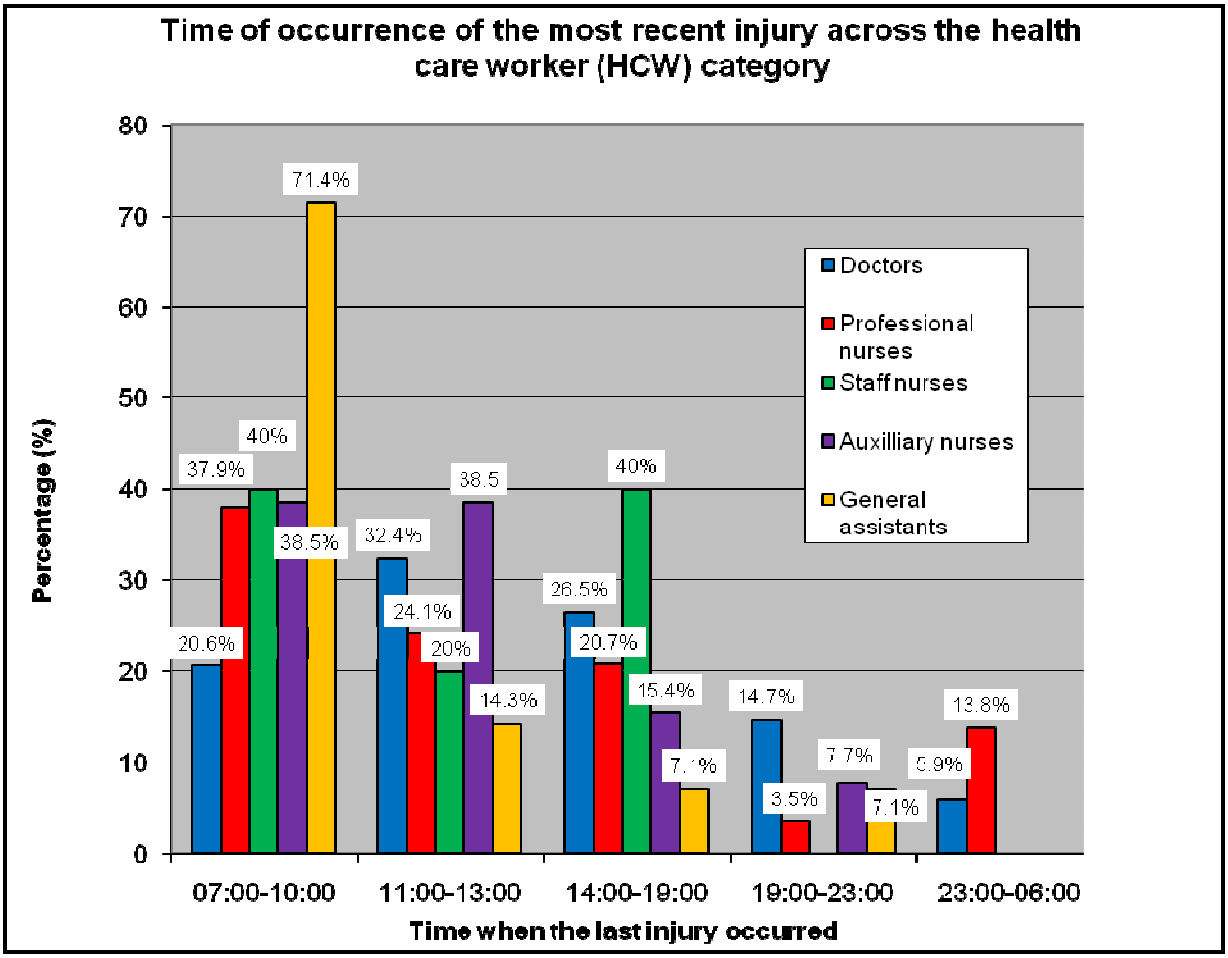


Figure 4.6: Time of the last occurrence of needle stick injuries (NSIs) across the health care workers (HCWs) category: Percentage (n=100)

McCracken (2008:1-64) conducted a study in the United Kingdom in 183 centres between 1st January 1997 and 31st December 2007. A total of 3773 occupational exposures to blood borne viruses (BBV) in health care workers (HCWs) in England, Wales and Northern Ireland were reported. These reports included data for the years: 2005 914 exposures occurred for 2006 483 occurred for 2007 431, with a total of 1358 exposures occurring from 2004 to 2007. In the wards, the majority of incidents occurred between the hours of 08:00 and 21:59, while a significant number 115 out of 575 (20%) occurring at 22:00-07:59. In theatre the number of exposures decreased from 74 out of 212 (35%) between 12:01-16:00 with a lower number of exposure between 16:01-21:59 namely, 58 out of 212 (27%) and further decrease of 17 out of 212 (8%) between 22:00

to 07:59. In Accident and Emergency unit (A&E), most of the reported incidents, mostly occurred between 22:00 and 07:59 hours 56 (37%) out of 153, with the lowest numbers occurring between 08:00 and 12:00 namely, 23 (15%) out of 153. In comparison, NSIs reported in Accident and Emergency units (A&E), showed two distinct peaks at 18:00-20:00 and 02:00. This was the busiest time during the night, when most emergency consultations took place. Due to the type of work performed in community and dental settings, the majority numbers of exposures 62 out of 88 (70%) and 47 out of 58 (81%), occurred between 08:00 and 16:00 hours.

In Table 4.14 the distribution of the 95% confidence interval for the percentages difference of the occurrence of the last NSIs sustained between 07:00 and 10:00 across the HCWs categories.

Table 4.14: Occurrence of needle stick injuries (NSIs) in health care workers (HCWs) that were sustained between 07:00 and 10:00: 95% confidence interval for the percentage difference (n=100)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-38.1%:4.9%]
Doctors *versus* Staff Nurses	[-57.7%:13.1%]
Doctors *versus* Auxiliary Nurses	[-45.8%:8.5%]
Doctors *versus* General assistances	[-70.6%:-20.1%]*
Professional Nurses *versus* Staff Nurses	[-42.0%:31.5%]
Professional Nurses *versus* Auxiliary Nurses	[-30.7%:27.0%]
Professional Nurses *versus* General assistances	[-56.2%:-1.8%]*
Staff Nurse *versus* Auxiliary Nurses	[-36.9%:43.9]
Staff Nurses *versus* General assistances	[-64.3%:13.8%]
Auxiliary Nurses *versus* General assistances	[-59.7%:3.9%]

* Statistical significant difference

There is a statistically significant difference in the percentage of HCWs who sustained a needle stick injuries (NSIs) from 07:00 and 10:00 between doctors and general assistants [-70.6%:-20.1%] and amongst professional nurses and general assistants [-56.2%:-1.8%]. There are differences, though not statistically significant, between other HCWs categories.

Ayas, Barger, Cade, Hashimoto, Rosner, Cronin, Speizer, and Czeisler (2006:1055-1062) conducted a study to evaluate the relationship between extended work hours and rates of percutaneous injuries in a diverse population of 2737 interns in the United States. The reported percutaneous injuries were 498 (0.029/intern-month). The evaluated worked shifts lasted longer than 24 hours in the period from July 2002 to May 2003. The comparison of rates of percutaneous injuries during day work (06:30-05:30) after working overnight (extended work) versus day work (non-extended work) and not proceeded by working overnight was also compared against injuries during the night shift (11:30-07:30) versus the day shift (07:30-03:30). The study results revealed percutaneous injuries more frequently during extended work shift compared with non-extended work shift (1.31%:n=1000) opportunities versus (0.76%:n=1000) opportunities, respectively; odds ratio [OR], 1.61; 95% confidence interval [CI], 1.46-1.78). Furthermore it was noted that during extended work shift injuries occurred after a mean of 29.1 consecutive work hours; while in a non extended work shift, injuries occurred after a mean of 6.1 consecutive work hours. Injuries were more prevalent during the night shift 1.48% than during the day shift opportunities versus 0.70% out of (1000) opportunities, respectively; (OR, 2.04; 95% CI, 1.98-2.11).

4.5.1.14 Awareness of the different health care workers (HCWs) categories regarding the needle stick injury policy in the institution: Percentage (n=91) and reasons for not being aware of the policy (n=9)

Figure 4.7 shows the percentage of HCWs who were aware of the policy on NSI. All 36 doctors, 30 professional nurses and 5 staff nurses indicated that they were aware of the NSI policy. On the other hand, only (71.4%:n=10) of the auxiliary nurses and (71.4%:n=10) general assistants indicated that they were aware of the NSI policy. Those who reported that they were not aware of the NSI policy were (28.6%:n=4) auxiliary nurses and (28.6%:n=4) general assistants, while one auxiliary nurse did not respond to this question.

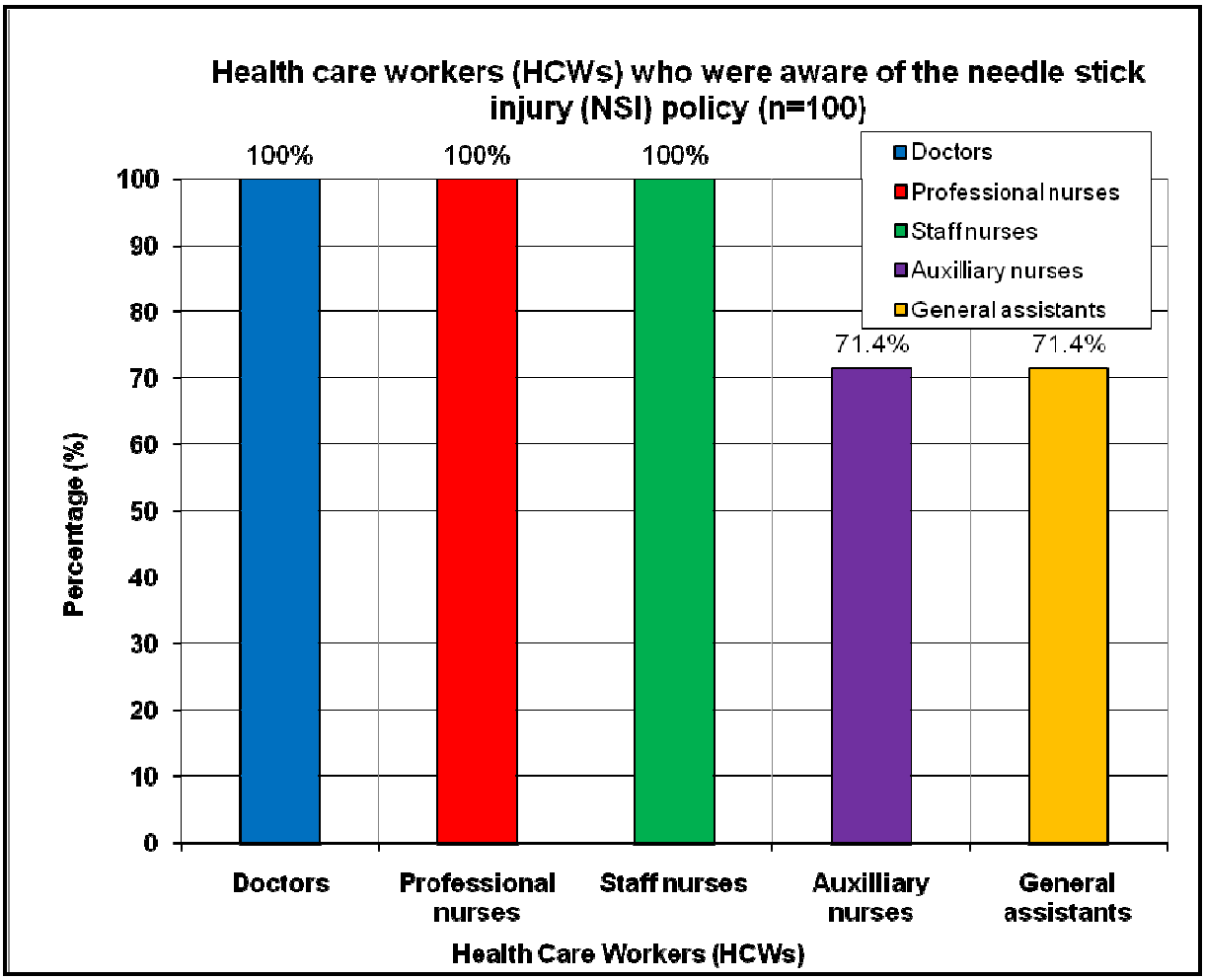


Figure 4.7: Health care workers (HCWs) who were aware of the needle stick injury policy: Percentage (n=91)

In a study done by Araf (2006:Online) in the Mwanza region of Tanzania, on 28 doctors who answered the questionnaire, 54% said that they were aware of the local guidelines on the management of or actions to be taken after sustaining a needle stick injury (NSI) while 43% indicated that they were not aware of the steps to be taken. Alam (2002:396-399) conducted in a study at the 100-bed Armed Forces Hospital, Sharourah, during January 2002. Out of 104 HCWs, 70 were nurses and 34 paramedical staff from different departments/wards of the hospital. The majority, 43 (61%) were knowledgeable of the universal precaution guidelines and those who were not knowledgeable were 27 (39%) out of 70. In another study, Gurubacharya *et al*. (2003 91-94) assessed the

knowledge, attitude and practice of health care workers (HCWs) on biological hazards and preventive measures regarding needle-stick injuries (NSIs), at a 500 bed tertiary care referral hospital Kathmandu (Medical College and Teaching Hospital). The HCW categories included: 57 (81%) nurses, 9 (13%), laboratory technicians 2 (3%) operation theatre assistants and dental technicians (3% n=2). Those health care workers (HCWs) who knew the precaution guidelines on NSIs were 46 (66%) and those who did not know the precaution guidelines were 24 (34%) out of 70.

Table 4.15 below shows the reasons cited by the respondents for not being aware of the policy on sustaining the needle stick injury (NSI). The health care workers (HCWs) who were not aware of the NSI policy were in the categories of the auxiliary nurses and general assistants.

Table 4.15: Health care workers' (HCWs) reasons for not being aware of the needle stick injury policy: Frequency and percentage (n=8)

Reasons for not being aware of the needle stick injury (NSI) policy	Auxiliary nurses (n=4)		General assistants (n=4)	
	f	%	f	%
"No one made me aware"	3	75.0	1	25.0
"Never taught"	0	0.0	1	25.0
"Never read policy or notice board"	0	0.0	1	25.0
"Don't understand English"	0	0.0	1	25.0
"I was not given information"	0	0.0	0	0.0
"Told policy after injury"	1	25.0	0	0.0

One general assistant did not answer the question

A total of 8 participants were not aware of the needle stick injury (NSI) policy. Three of the four auxiliary nurses (75%) indicated that "no one made them aware" of the policy and one (25%) indicated that s/he was "told about the policy after injury". Of the four (100%) general assistants, one mentioned two reasons.

Adebamowo, Ezeome, Ajuwon, and Ogundiran (2002:1471-2482) did research on the knowledge, attitude and risk perception regarding HIV infection and AIDS policy guidelines after sustaining a needle stick injury. The participants were 300 Nigerian surgery trainees. A total of 112 surgery trainees (37.3%) completed the questionnaire. A total of 88.4% respondents out of 112 respondents who sustained NSIs, only forty four percent 44.0% reported that they had an idea of the Centre for Disease Control (CDC) policy guidelines for universal precautions against blood borne pathogens (BBPs) and 13.8% out of 112 had no idea. While 42.2% reported that they knew the guidelines well out of 112.

4.5.1.15 Categories of health care workers (HCWs) who received and did not receive in-service training on the prevention and the management of needle stick injuries (NSIs): Percentage and 95% confidence interval for the percentage difference (n=99)

The distribution of the different HCWs categories who received in-service training on the prevention and management of needle stick injury (NSI) is shown in Figure 4.8. One staff nurse did not respond to this question. All staff nurses (100%:n=4) indicated that they received in-service training on the prevention of NSIs, followed by professional nurses (90%:n=27), then doctors (86.1%:n=31), then general assistants (71.4%:n=10) and lastly auxiliary nurses (53.3%:n=8). Those HCWs who indicated that they had in-service training on the management of NSI, were staff nurses (100%:n=4), professional nurses (93.33%:n=28), followed by doctors (88.89%:n=32), general assistants (71.43%:n=10) and auxiliary nurses (64.43:n=9). Seven auxiliary nurses (46.67%), general assistants (28.57%:n=4), doctors (13.89%:n=5) and professional nurses (10%:n=3) indicated that they did not receive any in-service training on the prevention of NSIs. Auxiliary nurses (35.71%:n=7), general assistants (28.57%:n=4), doctors (11.11%:n=4) and professional nurses (6.67%:n=2) indicated that they did not receive in-service training on the management of NSI.

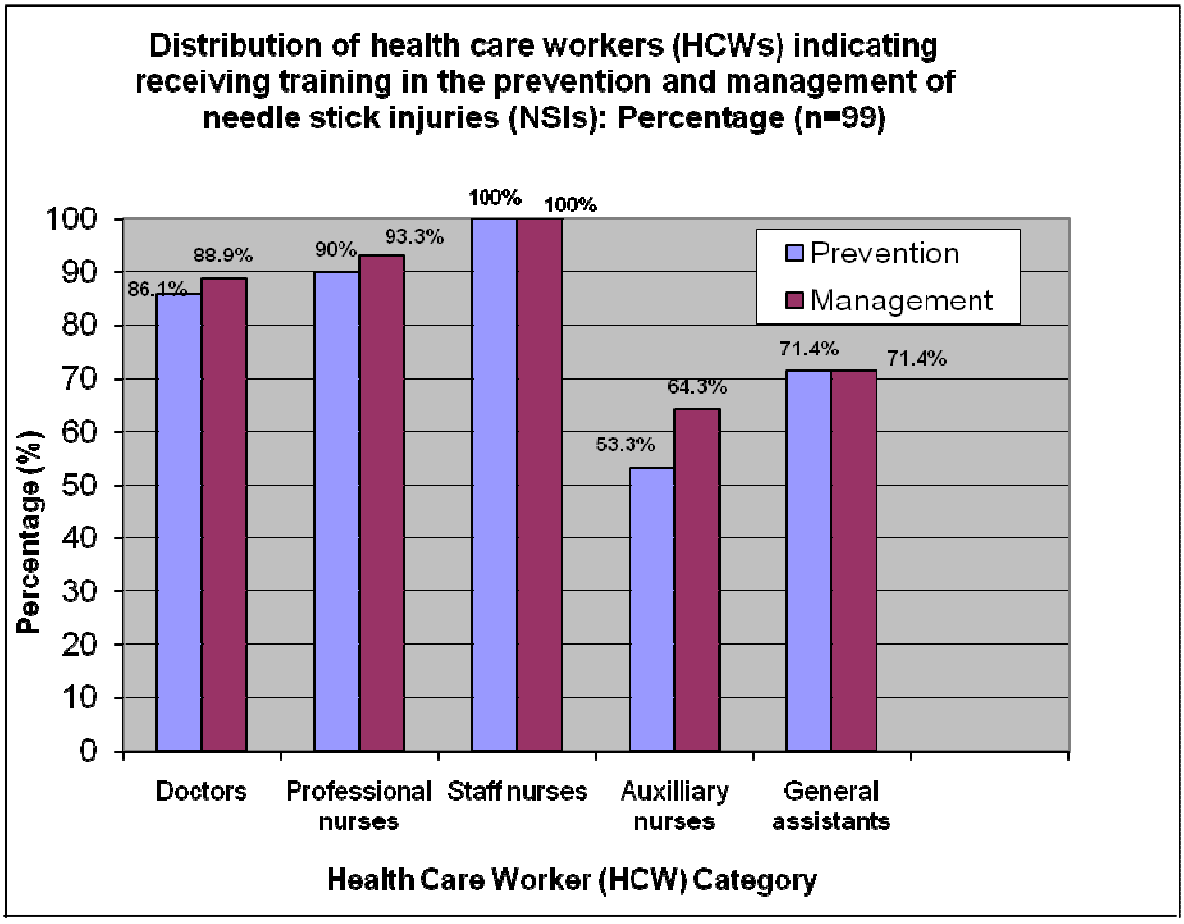


Figure 4.8: Distribution of health care workers (HCWs) who received in-service training on the prevention and on the management of needle stick injuries (NSIs): Percentage (n=99)

Yang *et al*. (2007:424-429) reported that training on prevention of NSI reduces the exposure rate to NSIs. This was confirmed by their study on the effectiveness of a training program to reduce the needle stick injuries (NSIs) and sharp object injuries among graduate vocational nursing school students in southern Taiwan. The study used pre test and post test questionnaires completed by all 107 graduates students. After educational intervention, the incidence of NSIs decreased significantly from 50.5% pre test to 25.2% post test, and the report rate increased from 37.0% to 55.6%, respectively. Training significantly reduced the incidence of NSIs and increased the reporting rate.

Table 4.16 below depicts the 95% confidence interval (CI) for the difference in percentage for HCWs category who received in-service training in the prevention and management of NSIs. There is a statistically significant difference [6.4%:57.3%] between doctors and auxiliary nurses in the percentages who received in-service training on the prevention of NSIs and also [0.6%:51.0%] on the management of NSIs. There is also a statistically significant difference between professional nurses and auxiliary nurses [9.8%:60.8%] who received in-service training on the prevention of NSIs and [4.8%:55.0%] on the management of NSIs. There is no statistically significant difference in the percentages of HCWs who received in-service training on the prevention and on the management of NSIs between other HCWs.

Table 4.16: Health care workers (HCWs) who answered "Yes" on receiving in-service training on the prevention (n=80) and on the management (n=83) of needle stick injuries (NSIs): 95% confidence interval for the percentage difference

Categories of health care workers (HCWs)	Prevention of NSIs (n=80)	Management of NSIs (n-83)
Doctors *versus* Professional nurses	[-20.0%:13.6%]	[-17.4%:11.7%]
Doctors *versus* Staff Nurses	[-15.9%:49.3%}	[-25.3%:38.3%]
Doctors *versus* Auxiliary Nurses	[6.4%:57.3%]	[0.6%:51.0%]*
Doctors *versus* General assistances	[-7.7%:41.9%]	[-4.6%:44.4%]
Professional Nurses *versus* Staff Nurses	[-12.6%:52.9%]	[-21.3%:42.6%]
Professional Nurses *versus* Auxiliary Nurses	[9.8%:60.8%]	[4.8%:55.0%]*
Professional Nurses *versus* General assistances	[-4.4%:45.5%]	[-0.4%:48.4%]
Staff Nurses *versus* Auxiliary Nurses	[-21.1%:55.1%]	[-17.0%:61.2%]
Staff Nurses *versus* General assistances	[-37.1%:39.4%]	[-23.2%:54.6%]
Auxiliary Nurses *versus* General assistances	[-46.8%:15.9%]	[-37.7%:25.3%

* Statistical significant difference

Gańczak *et al*. (2006: 175-180) did a study amongst 601 nurses regarding occupational exposures to blood borne viruses (BBV) working in surgical wards, operating rooms, and emergency departments, in Poland. The percentage of nurses without percutaneous exposure during the preceding year was significantly higher, namely, (56.7%) in the group that attended special HIV/AIDS training than in the group namely 41.7%, that did not receive training (95% CI, 5.8%-24.1%).

4.5.1.16 The depth of the sustained needle stick injury (NSI) across the health the different care workers (HCWs) categories: Percentage (n=100).

The depth of the sustained needle stick injury across the different HCWs categories is shown in Figure 4.9. Professional nurses (53.3%:n=16) were the category who indicated the highest deep penetration on the sustained NSIs; followed by staff nurses (40.0%:n=2), then doctors (36.1%:n=13), while auxiliary nurses (35.7%:n=5) reported the lowest as well as general assistants (21.4%:n=3).

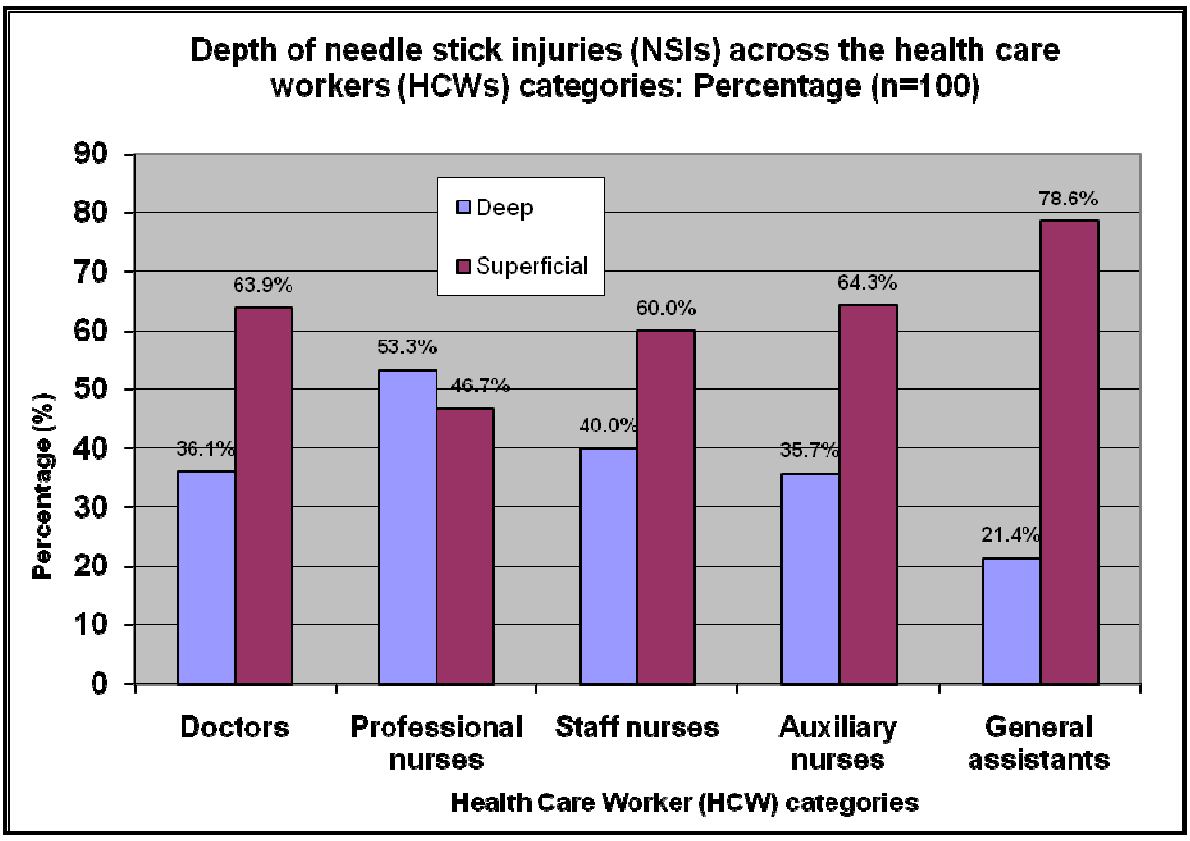


Figure 4.9: Depth of the sustained needle stick injuries (NSIs) across the health care worker (HCWs) category: Percentage (n=100)

The health care workers (HCWs) category who reported the highest score on superficial injuries was general assistants (78.6%:n=11), then auxiliary nurses (64.3%:n=9), followed by doctors (63.9%:n=23), staff nurses (60.%:n=3) and professional nurses (46.7%:n=14).

Singh (2004:1-4) from New Delhi together with inputs from the Medical Waste team, addressed the “save impact of needle stick injuries on health workers”, indicated that the depth of injuries lead to a greater blood transfer chance, thus increasing the probability of infection transmission. These are hollow bore phlebotomy needles, especially those of larger gauges than with solid suture needles tends to transfer more blood than other devices. Another study was conducted by Wang, Panlilio, Doi, White, Stek and Saah and The HIV PEP Registry Group (2000:780-785) on the experience of health care workers taking post-exposure prophylaxis (PEP) after occupational HIV exposures as well as on the findings of the HIV post-exposure prophylaxis (PEP). The study revealed that the depth of NSI for those who indicated “moderate with skin penetration” were 285 (69%), for “superficial surface scratch” 89 (22%), and “deep puncture or wound” were (9% n=39/413) out of 413.

In the most recent report from Exposure Prevention Information Network (EPINet) in United States on needle stick injuries (NSIs), Bandolier Extra (2003:Online), states the results for percutaneous injuries among 58 participating training and non training hospitals, which recorded 1 929 injuries in 2001. Large gauge hollow bore needles accounted for 15% NSIs, while sustained deep injury was 52%. Using logistic regression analysis, the 95% confidence intervals for Odds Ratio (OR) for the odds of seroconversion after exposure in workers with the risk factor compared with those without it. Seroconversion was more likely to accompany deep injury, visible blood on the device, procedure involving needle in artery or vein or the death of source patient with AIDS.

4.5.1.17 Distribution of the Human Immunodeficiency Virus (HIV) status of the source across the health care workers (HCWs) category: Percentage (n=100)

The distribution of HIV status of the source across the HCWs category is shown in Figure 4.10. In the study, health care worker (HCW) categories who sustained NSI from the Human Immunodeficiency Virus (HIV) positive source status was reported by 34%, while those who were injured by a needle from HIV negative source patient were 41%

and unknown source status of the patient were 25% out of 100. Health care worker who sustained NSIs from HIV positive sources patient category for staff nurses were (60.0%:n=3) and doctors (52.78%:n=19), which was the highest. Auxiliary nurses (33.33%:n=5) and professional nurses (23.33%:n=7) also had NSI from HIV positive sources patient. Needle stick injury sustained from an HIV negative source, was reported by professional nurses (63.33%:n=19), staff nurses (40%:n=2), auxiliary nurses (33.3%:n=5), doctors (30.56%:n=11) and general assistants (28.57%:n=4).

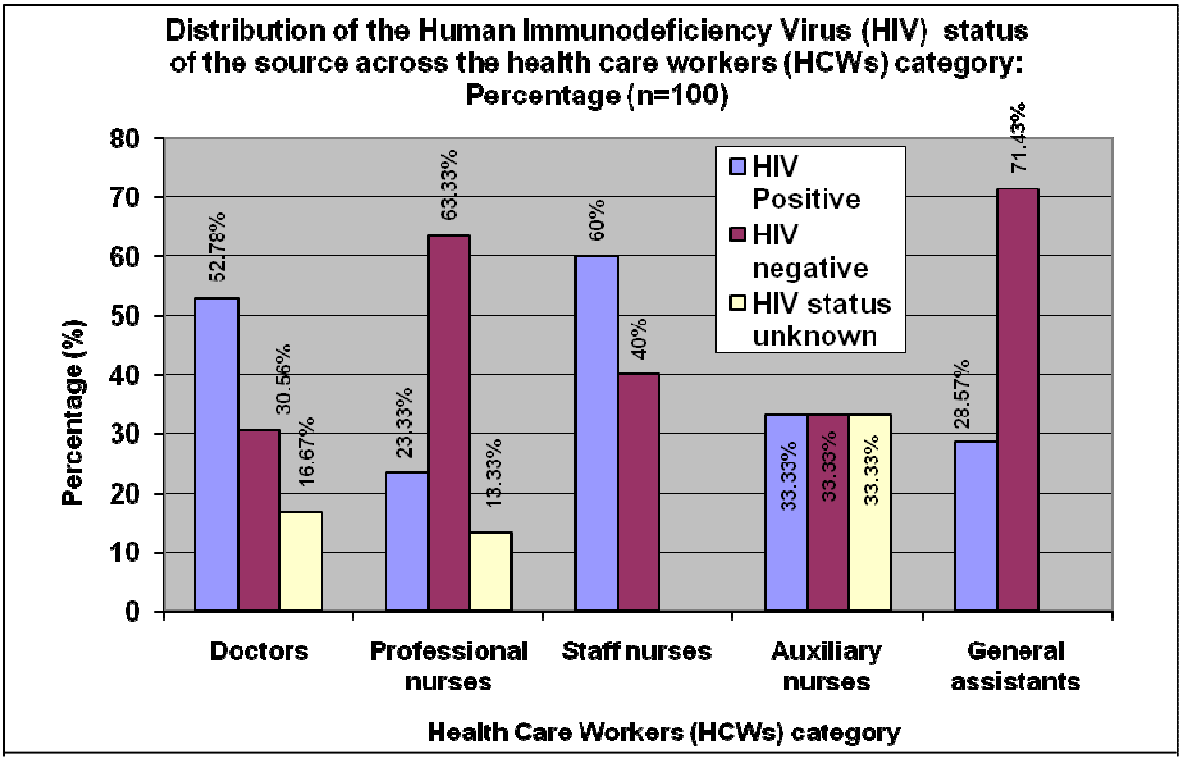


Figure 4.10: Distribution of the Human Immunodeficiency Virus (HIV) status of the source across the health care workers (HCWs) categories: Percentage (n=100)

What is alarming though is that general assistants (71.43%:n=10), auxiliary nurses (33.3%:n=5), doctors (16.67%:n=6) and professional nurses (13.33%:n=4) did not know what the HIV status of the source was.

McCracken (2008:1-64), discussed reports from the United Kingdom of the significant occupational exposures to blood borne viruses (BBV) in health care workers (HCWs).

These exposures occurred between 1st January 1997 and 31st December 2007, and were reported to the Centre for Infection Control enhanced surveillance system by 31st August 2008. Since 1997, there have been 3773 reported occupational exposure incidents in England, Wales and Northern Ireland. Of the percutaneous exposures 505 (22%) injuries, accounted for HIV positive source patients, while 166 (7%) exposures sustained were from HBV positive source and those who had NSIs exposures sustained from an unknown status for all three viruses (HIV, HCV&HBV) accounting for 354 (15%).

Bandolier Extra (2003:Online) in the most recent report from Exposure Prevention Information Network (EPINet) in United States on needle stick injuries (NSIs), gives the results for percutaneous injuries amongst 58 participating training and non training hospitals, which recorded 1 929 injuries in 2001. The HIV status of the source patient was known to be positive in 7%, HIV negative source status was reported by in 63% HCWs and those with unknown source status were 30%. Exposed HCWs who tested HIV positive were found in 0.15%.

4.5.1.18 The distribution of the responses on received and non-received pre-test counseling after exposure to needle stick injuries (NSIs) across the health care workers (HCWs) categories: Percentage and frequency and Reasons for not receiving pre-test counseling: Frequency and percentage (n=99)

The distribution of the responses on receiving and not received pre-test counseling after exposure to needle stick injuries (NSIs) across the health care workers (HCWs) category is shown in Table 4.17 below. The percentage of HCWs who received pre-test counseling after NSIs was (84.85%:n=84) as compared to those who indicated that they did not receive pre-test counseling after NSIs (15.15%:n=15).

Table 4.17: Distribution of the responses of health care workers (HCWs) who received and did not receive pre-test counseling after exposure to needle stick injuries (NSIs) across the health care workers (HCWs) categories: Frequency and percentage (n=99)

Categories of health care workers (HCWs)	Yes (n=84)		No (n=15)	
	f	%	f	%
Doctors (n=36)	29	80.6	7	19.4
Professional nurses (n=29)	23	79.3	6	20.7
Staff nurses (n=5)	4	80.0	1	20.0
Auxiliary nurses (n=15)	14	93.3	1	6.7
General assistances (n=14)	14	100.0	0	0.0

One (1) professional nurse did not respond to the question.

All, (100%:n=14) general assistants reported that they did receive pre-test counseling after exposure to needle stick injuries (NSIs), followed by (93.3%:n=14), auxiliary nurses, (80.6%:n=29) doctors then staff nurses (80%:n=4) and (79.3%:n=23) professional nurses. A total of (20.7%:n=6) professional nurses and (20%:n=1) staff nurse, indicated that they did not receive pre-test counseling after exposure to needle stick injuries (NSIs). Doctors (19.4%:n=7) and (6.7%:n=1) auxiliary nurse were in minority to be counseled after exposure to needle stick injuries (NSIs) whilst one professional nurse did not respond to this question.

Rele, Mathur, and Turbadkar (2002:206-207) conducted a study on the risk of needle stick injuries (NSIs) on HCWs for the period June 2000-2001. This study was at a Medical College General hospital in Mumbai. The aim was to analyze the self reported cases of needle stick injuries (NSIs) and other exposures to patient's blood or body fluids in HCWs. The self reported accidental injuries of a population of 38; included interns (n=2), nurses (n=4), technician (n=1), housekeeping staff (n=2), surgical specialties (n=22) and medical specialties (n=7). Of all the 38 study respondents, pre-test and post test counseling was done.

Freedman (2002:1-7) commenting on the policy of NSIs at the Groote Schuur Hospital, indicated that a pre-test counseling for HIV testing is essential. Any test has the potential to be positive and the consequences of a positive test have been shown to be

much more serious if pre-test counseling has not occurred. Ensuring that post exposure prophylactic (prevention) treatment is taken as early as possible (at least within 6 hours of injury). Further it has been indicated that there is a need to remove organizational and logistical obstacles namely, implications for the timing of testing as well as pre-test counseling of the source person. The Groote Schuur policy addressed a need to have a simple, consistent, practical policy for ensuring that the pre-test counseling for the source person takes place without delaying the focus or acquiring the prophylactic medication for the HCWs.

Table 4.18 below depicts reasons for not receiving pre-test counseling after the occurrences of NSIs. Of the 15 HCWs who indicated that they did not receive pre-test counseling 7 were doctors and 8 were professional nurses.

Table 4.18: Reasons of health care workers (HCWs) for not receiving pre-test counseling after sustaining a needle stick injury (NSI): Frequency and percentage (n=13)

Reasons for not receiving pre-test counseling after a needle stick injuries (NSIs)	Doctors (n=7)		Professional nurses (n=6)	
	f	%	f	%
"I am a qualified HIV counselor"	1	14.3	1	16.7
"Did not get it necessary to receive pre-test counseling"	2	28.6	0	0.0
"They said I am a nurse I can handle it"	0	0.0	1	16.7
"I was anxious, I couldn't wait for it"	0	0.0	1	16.7
"I am aware of all the factors involved"	1	14.3	0	0.0
"I don't know why it was not given"	1	14.3	0	0.0
"It was late as I went to casualty for pep"	0	0.0	1	16.7
"It was an emergency"	1	14.3	1	16.7
"I went to casualty"	0	0.0	1	16.7
"I went to occupational health clinic/ sickbay"	0	0.0	1	16.7
"No counselor after hours"	1	14.3	1	16.7

One staff nurse and one auxiliary nurse did not indicate reasons.

Three specific reasons were mentioned once by both doctors (14.3%:n=1) and professional nurses (16.7%:n=1) except for the reason “did not find it necessary to receive pre-test counseling” which was mentioned twice by doctors (28.6%:n=2) only.

Moody (2002 1-151) conducted a qualitative inquiry into doctor’s experience on whether pre test counseling was done. Two doctors (Doctors A & B) were interviewed on their experiences after a needle stick injuries (NSIs). Researcher asked questions such as: “… How do you think counseling would have worked for you, who did you tell after the injury, speaking to colleagues, other students? What sort of support did you get? Doctor A responded: “… where counseling would have helped would be that at least you could talk about what had pissed you off about the way it’s been handled, because there’s no support system. “… there’s no counseling, (pause) no nothing!” Doctor B responded as follows: “... be more careful about what you are doing because there is no major back up service. You know? If the incident is at three o’clock on a Saturday morning, it’s probably Monday morning perhaps when you get some information. We were certainly never briefed when we started our internship, about what to do if you get a needle stick injury, if you are at Johannesburg Hospital, you must proceed to this area or if you are at Baragwaneth Hospital, you must go here”. Doctor B responded: “Well, you want that reassurance, in a way. Essentially you speak to your colleagues but you want to speak to someone who has better knowledge of the thing. That’s why I made a point the next morning, I went to our infection control and sat down with like the professors, said look you know”. “You just want that reassurance, and the guy was quite reassuring, you know” responded Doctor B.

4.5.1.19 The distribution of the responses on receiving post-test counseling after exposure to needle stick injuries (NSIs) and the reasons for not receiving post-test counseling by the health care workers (HCWs) categories: Frequency and percentage (n=99)

The responses on whether the respondents received or did not receive post-test counseling are shown in Table 4.19. Auxiliary nurses (93.3%:n=14) who received post-test counseling were in the majority, followed by general assistants (92.9%:n=13), professional nurses (80%:n=24), with (60%:n=21) doctors and staff nurses (60%:n=3).

Table 4.19: Post-test counseling after exposure to needle stick injuries (NSIs) across health care workers (HCWs) categories: Frequency and percentage (n=99)

Categories of health care workers (HCWs)	Yes (n=75)		No (n=24)	
	f	%	f	%
Doctors (n=36)	21	60.0	14	40.0
Professional nurses (n=30)	24	80.0	6	20.0
Staff nurses (n=5)	3	60.0	2	40.0
Auxiliary nurses (n=15)	14	93.3	1	6.7
General assistants (n=14)	13	92.9	1	7.1

One (1) doctor did not respond to the question.

Those who indicated that they did not receive post-test counseling were doctors (40%:n=14), staff nurses (40%:n=2), professional nurses(20%:n=6), and lastly one general assistant and one auxiliary nurse respectively.

Lee, Botteman, Nicklasson, Cobden and Pashos (2005:741-747) conducted a study in the District of Columbia on needle stick injuries (NSIs) in an Acute Care environment. Out of 400 respondents, there were 110 nurses who experienced a NSI in the previous 12 months. Of the 110 nurses, a total of 22 (20.0%) nurses received care in their employee health department due to the NSI, 7 (6.4%) visited their primary care physician (PCP), while 10 (9.1%) received counseling after the incident. One nurse visited a primary care physician six times for counseling, and one nurse underwent 10 sessions of emotional/ infectious disease counseling as a result of the NSI. In total, there were 47 clinic visits, with 29 visits for counseling among those who experienced a NSI within 12 months. Two nurses missed one or more days for counseling due to side effects from HIV post exposure prophylaxis (PEP) medication, and 17 nurses missed at least one day due to emotional distress and anxiety following the NSI. Forty six nurses (41.8%) felt anxious, depressed, or stressed as a result of the NSI.

Dieleman, Bwete, Maniple, Bakker, Namaganda, Odaga and van der Wilt (2007:6963-6967) conducted a study on the impact of HIV/AIDS on HCWs in four rural hospitals in Uganda (hospital A, B, C and D). The total population was 594 HCWs in all the four hospitals which included: support staff, allied health professionals, enrolled nurses, midwives, doctors, and auxiliary- as well as professional nurses. The anticipated sample was 237 HCWs who were in direct contact with patients or patients' fluids, though only 44 respondents were interviewed. There were significant differences in the reported use of services by staff between the hospitals: Eighty three percent respondents in hospital A reported using counseling and testing services, compared to an average of 61% and 63% ($p < 0.001$) in hospital B, C and D. In none of the four hospitals a system was in place to assist staff when they faced emotional difficulties, although opportunities existed. However HCWs indicated that these sessions might be considered too 'public' to deal with HCWs' emotions.

4.5.1.20 Reasons for not receiving post-test counseling after exposure to needle stick injuries (NSIs) across the health care workers (HCWs) categories: Frequency and percentage (n=23)

The reasons for not receiving post-test counseling amongst the health care workers (HCWs) categories are given in Table 4.20. A total of 12 reasons for not receiving post-test counseling were cited by the study respondents. All doctors, professional nurses and staff nurses indicated that they were aware of the NSI policy, but contradicting responses were given as reasons for not receiving post-test counseling. What is alarming though is that one doctor who should known that there is a window period with HIV infection, according to the qualification, indicated that s/he did not go for post test counseling due to the fact that the source was HIV negative.

Table 4.20: The reasons for not receiving post-test counseling after exposure to needle stick injuries (NSIs) across the health care workers (HCWs) categories: Frequency and percentage (n=23)

Categories of health care worker (HCWs)	Doctors (n=14)		Professional nurses (n=6)		Staff nurses (n=2)		Auxiliary nurses (n=1)	
	f	%	f	%	f	%	f	%
"Phoned for my own results"	1	7.1	0	0.0	0	0.0	0	0.0
"No need"	4	28.6	0	0.0	0	0.0	0	0.0
"Post test counseling would not bring anything new to which I already know"	1	7.1	1	16.7	0	0.0	0	0.0
"They said I am a nurse I can handle it"	0	0.0	2	33.3	0	0.0	1	100.0
"Reporting procedure not followed"	0	0.0	0	0.0	1	50.0	0	0.0
"Patient was HIV negative"	1	7.1	0	0.0	0	0.0	0	0.0
"Did HIV testing privately"	1	7.1	0	0.0	0	0.0	0	0.0
"I did not know I must get it"	1	7.1	1	16.7	1	50.0	0	0.0
"No one gave me post test counseling"	1	7.1	2	33.3	0	0.0	0	0.0
"I was a student"	1	7.1	0	0.0	0	0.0	0	0.0
"Not able to return due to hectic ward schedule"	1	7.1	0	0.0	0	0.0	0	0.0
"Results still pending"	1	7.1	0	0.0	0	0.0	0	0.0

One (1) general assistant did not complete this question.

According to two of the six professional nurses and one auxiliary nurse they were told that they are nurses "they can handle it" which is a violation of their human rights namely the right to receive post-test counseling as was announced in the Government Gazette: National Policy on testing for HIV by the then Minister of Health, Tshabalala-Msimang (1999:Online).

4.5.2 SECTION B: PRACTICES LEADING TO NEEDLE STICK INJURIES (NSIs) (n=100)

Section A detailed results of the information on needle stick injuries (NSIs) were discussed. Section B results of 8 questions that deal with the practices leading to needle stick injuries (NSIs) will be discussed. The eight questions included three (3) closed and five (5) open ended questions eliciting the reasons for practices that led to NSIs.

4.5.2.1 Causes of needle stick injuries (NSIs) across health care worker (HCWs) categories: Frequency and percentage (n=100)

The causes of needle stick injuries (NSIs) across health care worker (HCW) category are shown in Figure 4.11. Eight causes of NSIs were identified by the different HCW categories. The most important cause of NSIs was the manipulation the of needle by staff nurses (60%:n=3), followed by doctors (47.2%:n=17), then professional nurses (20%:n=6) and lastly auxiliary nurses (13.3%:n=2). The second cause, was directly linked to disposal of the needle, with professional nurses (20%:n=6), staff nurses (20%:n=1), doctors (13.9%:n=5) and lastly auxiliary nurses (13.3%:n=2). The third cause indicated by the respondents was collision with another worker. This was reported by staff nurses (20%:n=1), doctors (13.9%:n=5), professional nurses (10%:n=3), and lastly auxiliary nurses (6.7%:n=1). The fourth cause, cannulation was reported by Professional nurses reported (13.3%:n=4), doctors (11.1%:n=4) and auxiliary nurses (6.7%:n=1). The fifth cause of NSIs reported was passing the device to someone else. This was reported by professional nurses (13.3%:n=4), auxiliary nurses (6.7%:n=1) and lastly doctors (5.6%:n=2). The sixth reason was waste the disposal (cleaning up) which accounted for more NSIs in general assistants (50%:n=7), professional nurses (6.7%:n=2), doctor (2.7%:n=1) and auxiliary nurse (6.7%:n=1). The seventh indicated cause was wrong disposal of needle or device; with general assistants (50%:n=7) and professional nurses (20%:n=4) involved.

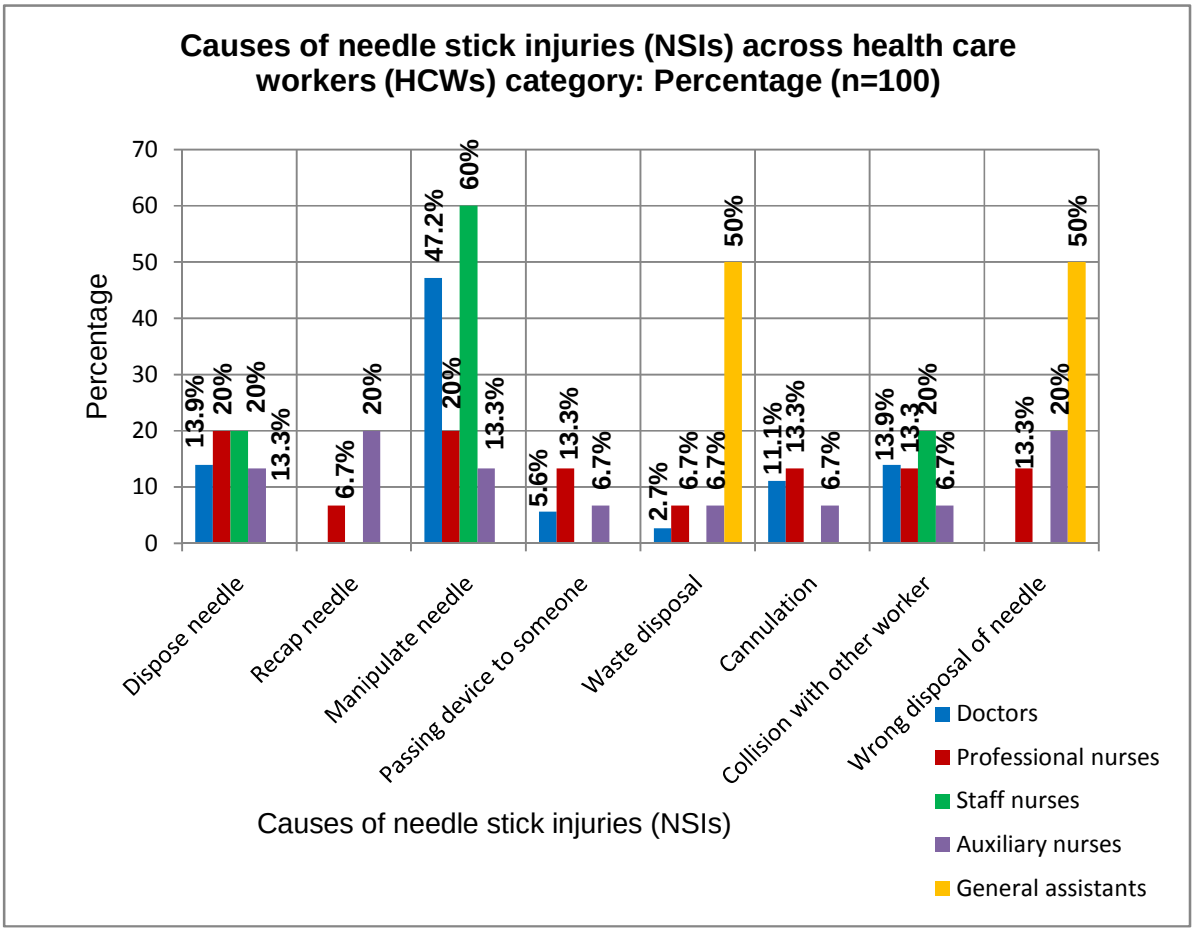


Figure 4.11: Causes of needle stick injuries (NSIs) across health care workers (HCWs) categories: Percentage (n=100)

The eighth indicated cause was recapping of needle with professional nurses (6.7%:n=2) and auxiliary nurses (20%:n=3). General assistants did not report any NSIs caused by the following: manipulation, disposal or recapping the needle, passing the device to someone else, cannulation or collision with another worker.

Saulat (2005:233–238) conducted a study on the epidemiology of needle stick injuries in the 212 bed Central Hospital, in Buraidah, Saudi Arabia. The study was done from January 2002 to December 2003. In a period of two (2) years, 73 NSIs and other sharp objects injuries were reported. Twenty-nine (39.7%) injuries occurred during a clinical procedure in surgery, or were intravenous (IV) line related, or when handling/passing the device. Thirty nine (53.4%) occurred after finishing a clinical procedure but before

disposal was done (recapping, collision with sharp and disposal related), and five (6.8%) occurred after disposal was done (concealed sharps). There were 21 (29%) needle stick injuries (NSIs) due to recapping of used needles. Fourteen (19%) of the injuries were reported doing surgical procedures. Another major reported cause was collision with sharps held by other HCW and included incidences such as transferring blood from the syringe to the vial and missing the target. Eight (11%) of these incidents were disposal related, which included incidences such as dismantle surgical instruments from the used needles and syringes for disposal. The most common procedure reported to cause such NSIs in each of the job categories also varied. Amongst physicians, the injuries occurred while suturing or doing a surgical procedure. Nurses sustained a needle stick injury (NSI) while recapping a needle, disposing of a used needle, or injecting medicine or drawing blood. Sanitary staff sustained NSIs, in the majority of cases, while disposing of garbage.

4.5.2.2 Adherence of health care workers' (HCWs) to wearing prescribed personal protective clothing (PPE) at the time of occurrence of needle stick injuries (NSIs): Frequency and percentage and 95% confidence interval for the percentage difference (n=99)

The responses of health care workers (HCWs) who wore prescribed protective clothing are shown in Table 4.21. The highest adherence of wearing personal protective clothing (PPE) during exposure among HCWs categories were amongst general assistants (92.9%:n=13), followed by doctors (85.7%:n=30) and professional nurses (76.7%:n=23). Staff nurses (40%:n=2) and auxiliary nurses (26.7%:n=4) reported that they adhered to wearing PPE.

Table 4.21: Health care workers' (HCWs) adherence to wearing prescribed personal protective clothing (PPE) at the time of occurrence of needle stick injuries (NSIs): Frequency and percentage (n=99)

Categories of health care workers (HCWs)	Yes (n=72)		No (n=27)	
	f	%	f	%
Doctors (n=35)	30	85.7	5	14.3
Professional nurses (n=30)	23	76.7	7	23.3
Staff nurses (n=5)	2	40.0	3	60.0
Auxiliary nurses (n=15)	4	26.7	11	73.3
General assistants (n=14)	13	92.9	1	7.1

One (1) doctor did not answer this question

According to the highest percentage for not wearing personal protective clothing (PPE) during exposure to NSIs were amongst the auxiliary nurses (73.3%:n=11) and staff nurses (60%:n=3). The percentage for not wearing personal protective clothing (PPE) during exposure to NSIs amongst professional nurses was (23.3%:n=7), doctors (14.3%:n=5) and general assistants (7.1%:n=1).

Jovic-Vranes, Jankovic and Vranes (2006:377-382) conducted a study in Serbia amongst 1559 health care workers (HCWs) on safety practice and exposure to blood and blood containing materials for a period of one year. Of a total of 921, HCWs, 59% had skin contact with a patient's blood. Seven hundred and ninety one 51% had needle stick injuries (NSIs), 599 (38%) cuts from sharp instruments while 34%, had contact of eye and other mucosa with patient's blood. Appropriate safety practices or barriers in all procedures during contact with patients were indicated to be 58% for gloves, 23% masks and 4% glasses. Doctors were using personal protective clothing (PPE) more regularly than others.

Naghavi and Sanati (2009:101-106) in their study reported 175 exposures to blood and body fluid (BBFs) amongst doctors for the period 1 January 2005 to 31 December 2007. This data was reported in the Exposure Prevention Information Network (EPINet) and

was used in a study done over 3 years in the United Kingdom (UK). Out of the175 blood and body fluid exposures (BBF) reported, 82% were needle stick injuries (NSIs) and 18% were splashes. Eighty one (46%) NSIs occurred in senior doctors and 94 in junior doctors (54%). Needle stick injuries (NSIs) were reported whilst personal protective clothing (PPE) was used amongst 10 senior doctors for double gloves (15%), 54 single gloves (81%) while 3 did not wear gloves (5%). Junior doctors 6 used double gloves (8%) when they sustained NSIs, while single gloves were worn by 57 (77%) and 11 (15%) did not wear gloves at all.

The 95% confidence interval for the percentage difference of the (HCWs) categories who wore personal protective equipment (PPE) during exposure to NSIs is depicted in Table 4.22 below.

Table 4.22: Health care workers (HCWs) categories who wore personal protective clothing (PPE) during exposure to needle stick injury (NSI): 95% confidence interval for the percentage difference (n=99)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-10.0%:28.4%]
Doctors *versus* Staff nurses	[5.8%:75.1%]*
Doctors *versus* Auxiliary nurses	[29.6%:76.7%]*
Doctors *versus* General assistants	[-23.3%:18.5%]
Professional nurses *versus* Staff nurses	[-4.2%:67.2%]
Professional nurses *versus* Auxiliary nurses	[19.2%:69.5%]*
Professional nurses *versus* General assistants	[-34.7%:10.7%]
Staff nurses *versus* Auxiliary nurses	[-24.6%:53.5%]
Staff nurses *versus* General assistants	[-81.7%:-8.6%]*
Auxiliary nurses *versus* General assistants	[-83.0%:-31.1%]*

* Statistically significant difference

Regarding the wearing of PPE, there was a statistically significant difference in the percentages of doctors and staff nurses [5.8%:75.1%], doctors and auxiliary nurses [29.6%:76.7%], professional nurses and auxiliary nurses [19.2%:69.5%], staff nurses and general assistants [-81.7%:-8.6%] as well as auxiliary nurses and general assistants [-83.0%:-31.1%]. There were differences though not statistically significant between other HCWs categories.

Manian and Ponzillo (2007:337-340) did a study at first level care facilities in Pakistan, to observe the compliance with routine use of gowns by healthcare workers (HCWs) and visitors to patients. The observation was done on patients on entry into the rooms under contact precautions. Compliance and routine use of gowns were observed in 1,542 health care workers (HCWs) and visitors. Of the 1,542, observed HCWs were 1,150 (76%) and visitors were 392 (65%) (odds ratio [OR], 1.8 [95% confidence interval {CI}, 1.4-2.2]; P<.001). Visitors 186 in the ICUs (91%) out of 204, were more likely than 202 visitors in the general wards (51%) out of 398 who complied with gown use (OR, 10 [95% CI, 6.0-17.0]; P<.001). In logistic regression analysis, the independent predictors of gown compliance among HCWs were females (OR, 2.3 [95% CI, 1.8-3.0]; P<.001) and in ICU settings (OR, 2.2 [95% CI, 1.7-2.9]; P<.001). In the ICUs, gown use was highly predictive of glove use among HCWs (positive predictive value, 95%).

4.5.2.3 Type of personal protective clothing (PPE) worn by health care workers (HCWs) categories during exposure to needle stick injuries (NSIs): Frequency and percentage (n=72)

The types of prescribed personal protective clothing (PPE) worn by HCWs categories at the time of the NSIs is shown in Figure 4.12. Seventy two of the 100 health care workers (HCWs) indicated that they wore prescribed personal protective clothing (PPE) when during needle stick injuries (NSIs) occurred. The majority of HCWs wore surgical gloves. All staff- and auxiliary nurses (100%) worn gloves, followed by professional nurses (95%:n=22), then doctors (93.3%:n=28) and lastly general assistants (92.3%:n=12). Gowns were worn only by doctors (16.7%:n=5) and one professional nurse (4.4%). One general assistant (7.7%) was wearing heavy duty gloves during the occurrence of NSI. Some HCWs category were wearing more than one prescribed personal protective clothing (PPE), for example, doctors and professional nurses indicated that they were wearing gloves, aprons and gowns. One auxiliary nurse did not answer this question.

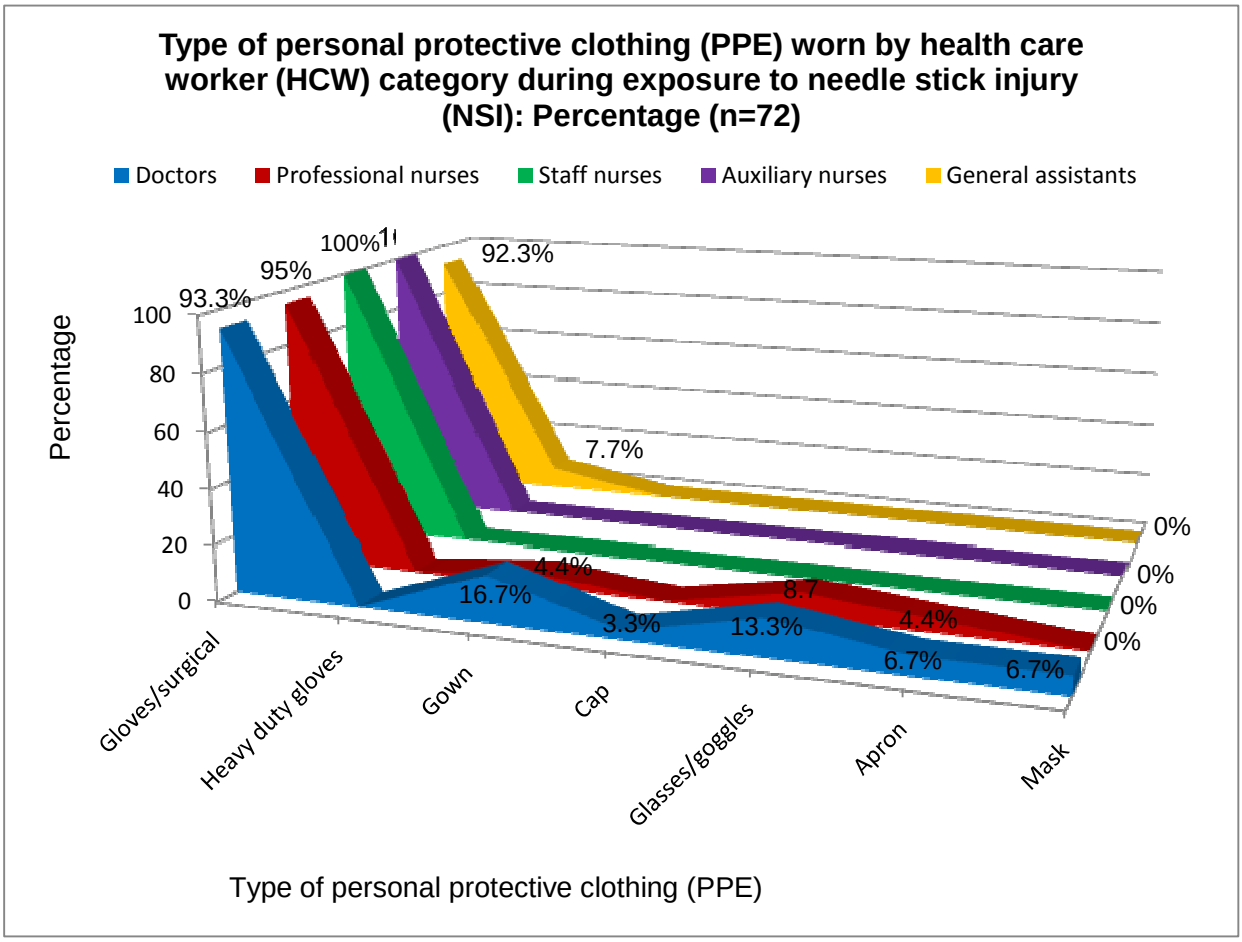


Figure 4.12: Type of personal protective clothing (PPE) worn by health care workers (HCWs) categories during exposure to needle stick injuries (NSIs): Frequency and percentage (n=72)

Bi, Tully, Pearce and Hiller (2006:465-471) conducted a study on occupational blood and body fluid exposure (BBFE) in an Australian teaching hospital. The study was conducted in a 1000 bed tertiary hospital between the period 2000 and 2003 using a total of 640 sharps injuries and body fluid exposures reported from hospital and non-hospital staff. The study showed that reporting was consistent throughout the study period, with medical staff, mainly 10.4% experiencing the highest rate of sharps injury. Hollow-bore needles were implicated in 51.7% of all percutaneous injuries. Most incidents, 40.4% occurred during sharps use while 27.1% after use but before disposal. Nursing staff experienced 68.5% of the reported exposures. Many 61.1% of such

exposures occurred in the absence of any protective attire. This study indicated that an emphasis should be placed on work practice, attire, disposal systems and education strategies to prevent and manage NSIs.

Alam (2002: 396-399) did a study on the knowledge, attitude and practices amongst health care workers (HCWs) on needle-stick injuries (NSIs) and found that the use of gloves during phlebotomy procedures was not always adhered to. The study was conducted amongst 70 HCWs at a 100 bed Armed Forces Hospital in Sharourah during January 2002 that included nurses and paramedical staff from different departments/wards in the hospital. These health care workers (HCWs) were directly exposed to blood products and needle-stick injuries (NSIs) while dealing with patients. Of the 70 respondents, 27% were using gloves regularly for phlebotomy procedures, with 19 (27%), who reported the use of gloves all the times, followed by 48 HCWs (69%) who used gloves occasionally and 3 (4%) who never wore gloves during phlebotomy procedures.

4.5.2.4 Reasons of health care workers (HCWs) categories for not wearing the prescribed personal protective clothing (PPE) during exposure to needle stick injuries (NSIs): Frequency and percentage (n=27)

The reasons indicated by HCWs categories (n=27) who did not wear prescribed personal protective clothing (PPE) on the day of NSI is depicted in Figure 4.13. Doctors indicated reasons such as “was in a hurry” (20%:n=1); “was working with a premature baby” (20%:n=1) and “patient was clinically low risk” (40%:n=2). One doctor indicated that s/he did not wear the prescribed personal protective clothing (PPE) but did not indicate the reason. Professional nurses gave three different reasons namely: “not necessary” (42.9%:n=3), “I was cleaning we don’t wear personal protective clothing” (PPE) (14.3%:n=1) and “I was working with a premature baby” (14.3%:n=1). The reasons staff nurses gave were “not necessary” (66.7%:n=2) and “never thought a needle will prick me” (33.3%: n=1).

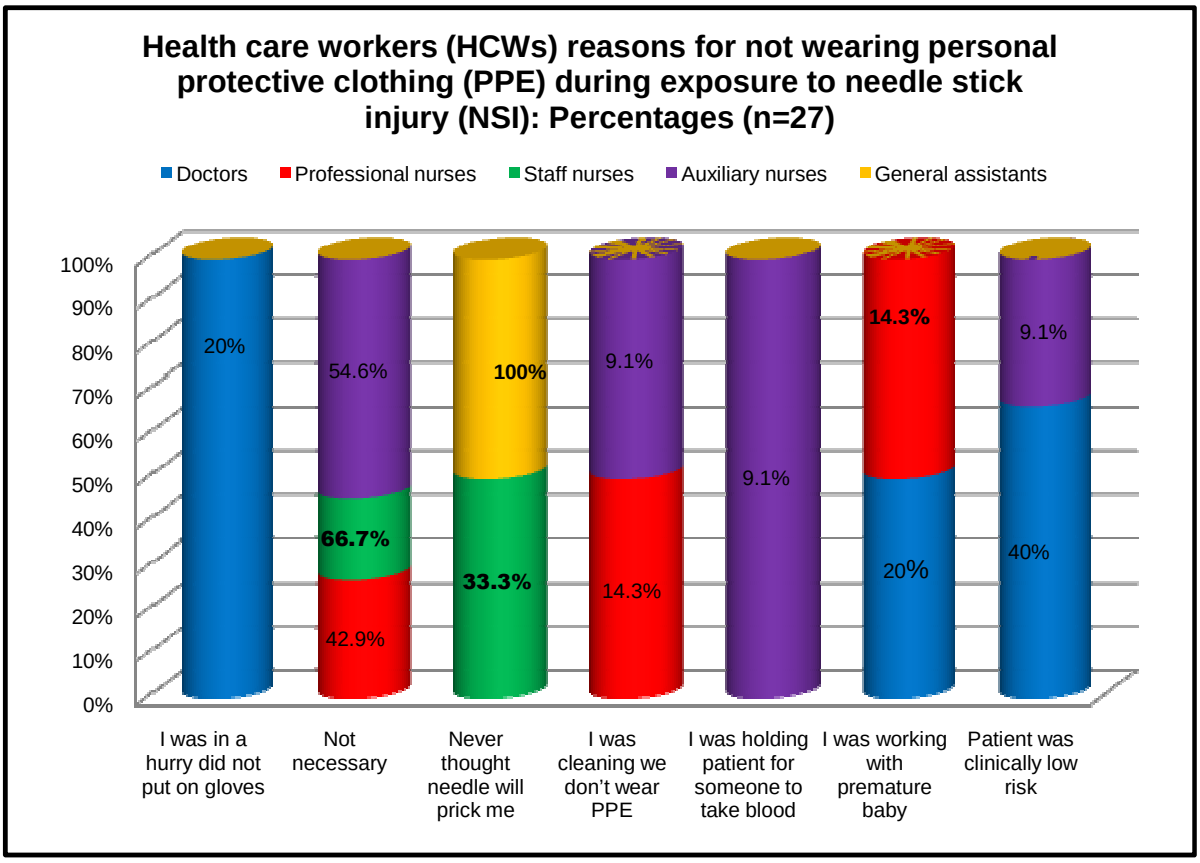


Figure 4.13: Reasons given by health care workers (HCWs) given for not wearing personal protective clothing (PPE) during exposure to needle stick injuries (NSIs): Percentage (n=27)

Six auxiliary nurses (54.6%) gave the following reasons: "… thought it was not necessary", while one (9.1%:n=1) indicated that "… I was cleaning we don't wear PPE" while another (9.1%:n=1) indicated that "… I was holding patient for someone to take blood" and "patient was clinically low risk" (9.1%:n=1). Only one general assistant (100%) did not wear PPE and gave the reason that "… s/he did not think that a needle will prick her/him". One auxiliary nurse did not mention a reason.

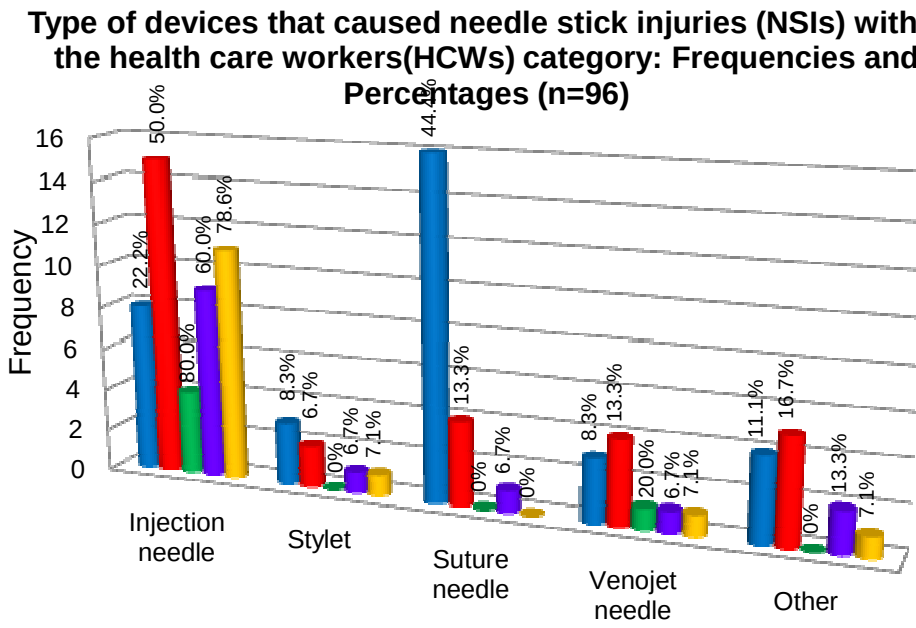
Adebamowo *et al*. (2002:1471-2482) conducted a study on HIV infected persons and AIDS patients. The study population was Nigerian Surgery trainees. They were anticipated to be 300, but only 112 (37.3%) responded to the survey. Forty percent (40%) of the respondents had an idea of the Center for Disease Control and Prevention (CDC) guidelines, though 85.6% did not use personal protective equipment (PPE) and

gave the reason that "… they were often not available", while 6.7% of the respondents indicated "… forgot to use them". Other respondents (2.2%), reported that the reason for not using personal protective equipment (PPE) was having a "… feeling that they were not needed" while 1.1% of the respondents indicated that "… did not know about them" and 4.4% gave no reason.

Janjua *et al*. (2007:1471-2334) did a study on health care workers (HCWs) working at public and private sector's first level health care facilities in districts of Pakistan. A total of 239 respondents from 172 clinics were interviewed. The majority of the participants (69.5%:n=166) were dispensers followed by 42 MBBS (Bachelor of Medicine, Bachelor of Surgery) (17.6%) prescribers with 22 non-MBBS prescribers (9.6%) and 9 housekeepers (3.8%). Poor compliance to the use of personal protective clothing (PPE) was the highest amongst the prescribers, namely 15, out of 239 (37%) who reported never using gloves for procedures, while more than 50% of other categories of HCWs also never used gloves during performing procedures with potential blood or body fluid exposure.

4.5.2.5 Type of devices that caused needle stick injuries (NSIs) within the health care workers (HCWs) categories: Frequency and percentage (n=96)

The types of devices that caused NSIs within the different health care workers (HCWs) categories are presented in figure 4.14. Doctors (44.4%:n=16) sustained most NSIs from suture needles while (22.2%:n=8) injection needles. Professional nurses (50%:n=15) sustained most NSIs from injection needles (16.67%:n=5,) followed by suture needle (13.3%:n=4) and venoject needle (13.3%:n=4). Staff nurses sustained most NSIs from injection needles (80%:n=4) and from venoject needles (20%:n=1). Auxiliary nurses sustained most NSIs from injection needles (60%:n=9), then venoject needles (6.67%:n=1) followed by a stylet (6.67%:n=1). General assistants sustained most NSIs from injection needles (78.57%:n=11) followed by venoject needles and a stylet needle (7.14%:n=1) respectively.



	Injection needle	Stylet	Suture needle	Venoje t needle	Other
Doctors	8	3	16	3	4
Professional nurses	15	2	4	4	5
Staff nurses	4	0	0	1	0
Auxilliary nurses	9	1	1	1	2
General assistants	11	1	0	1	1

Two doctors, one auxiliary nurse and one general assistant did not answer this question.

Figure 4.14: Type of devices that caused needle stick injuries (NSIs) within the health care workers (HCWs) categories: Percentage (n=96)

In the light of the results showed in figure 4.14, it is alarming that half of the professional nurses (50%:n=15), staff nurses (80%:n=4), auxiliary nurses (60%:n=9) as well as

general assistants (78.6%:n=11) sustained NSIs caused by injection needles. Only doctors (44.4%:n=16) on the other hand sustained NSIs with suturing needles in majority.

In a study done by Naghavi and Sanati in 2009 (101-106) Accidental blood and body fluid (BBF) exposure amongst doctors was investigated by. One hundred and seventy-five (175) exposures of BBF exposures in doctors were reported over the 3-year study period reported to the Exposure Prevention Information Network (EPINet) in four teaching hospitals in the UK. Of these exposures, 82% were needle stick injuries and 18% were splashes. The incidence rate per 100 person-years was 13 (95% CI 11–16) in junior doctors and 4 (95% CI 4–5) in senior doctors with a relative risk of 3 (95% CI 2–4). In junior doctors, the majority of percutaneous exposures mainly 22% occurred when a disposable syringe with needle was used, followed by suture needles (18%) and blood gas syringes (12%). In senior doctors with NSIs, the most frequent device was suture needle (31%), followed by disposable syringe with needle (15%) and scalpel (13%). However, the highest proportion of percutaneous exposures was from hollow-bore needles (57%).

Saulat (2005:233–238) did a retrospective study on self reported NSI in a 212-bed secondary care, Buraidah Central hospital in Saudi. The population was 73 documented self-reported needle stick injuries (NSIs). Of these injuries, 34 (46.57%) injuries took place in 2002 and 39 (53.43%) in 2003. Amongst physicians, most of the injuries occurred while suturing or doing a surgical procedure, while nurses sustained a needle stick injury while recapping a needle, injecting medicine, or drawing blood. In the majority of cases sanitary staff acquired NSIs while disposing of garbage. The syringe needles caused 46 (63%) of the injuries, stylet of cannula 10 (13.7%), suturing needles for 11 (15.1%) and 6 (8.2%) of the injuries were caused by other sharps.

4.5.2.6 Health care workers (HCWs) categories who sustained needle stick injuries (NSIs) due to injection needles: 95% confidence interval for the percentage difference (n=47)

The 95% confidence interval for the percentages difference of HCWs categories who were injured by injection needles are presented in Table 4.23.

Table 4.23: Health care workers (HCWs) who were injured by injection needles: 95% confidence interval for the percentage difference (n=47)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[-47.6%:- 4.6%]*
Doctors *versus* Staff nurses	[-77.2%:-12.5%]*
Doctors *versus* Auxiliary nurses	[-60.5%:-8.8%]*
Doctors *versus* General assistances	[-73.75:-25.8%]*
Professional nurses *versus* Staff nurses	[-53.5%:15.7%]
Professional nurses *versus* Auxiliary nurses	[-36.3%:19.5%]
Professional nurses *versus* General assistants	[-50.4%:2.5%]
Staff nurses *versus* Auxiliary nurses	[-27.0%:49.3%]
Staff nurses *versus* General assistants	[-43.2%:32.3%]
Auxiliary nurses *versus* General assistants	[-46.5%:14.5%]

* Statistically significant difference

There was a statistically significant difference in the percentages of doctors and professional nurses [-47.6%:-4.6%], doctors and staff nurses [-77.2%:-12.5%], doctors and auxiliary nurses [-60.5%:-8.8%] as well as doctors and general assistants [-73.75:-25.8%] who were injured by injection needles. There were differences, although not statistically significant, between the other HCWs categories.

Smith, Choe, Jeong, Jeon, Chae and An (2006:359-366) conducted an epidemiological study on epidemiology regarding needle stick and sharps injuries amongst professional nurses in Korea. They surveyed 432 nurses from Gangneung in Korea hospital, with a response rate of 97.9%. A total of 263 NSIs was reported by nurses (79.7%) in the previous 12 month period (average, 1.31 events per nurse per year). Nurses sustained NSIs from syringe needles as the most common devices, affecting 67.3%, comprising of 52% of all NSIs. 35.2% injury by sharp devices were sustained while opening an ampoule or vial. Logistic regression analysis indicated that nurses working in "other" departments were 5.4 times more likely to suffer NSIs (odds ratio [OR] = 5.4; 95% confidence interval [95% CI] = 2.0–15.2; P < .05) and 4.7 times more likely to incur a syringe-needle injury than nurses in intensive care units or inpatient departments (OR = 4.7; 95% CI = 2.0–11.6; P < .05). Nurses younger, (< 27 years) were 4.5 times more likely to suffer NSIs (OR = 4.5; 95% CI = 1.7–12.6; P < .05) and 3.1 times more likely to incur a syringe needle injury (OR = 3.1; 95% CI = 1.4–7.0; P < .05) or syringe needle NSI (OR = 4.4; 95% CI = 2.0–10.1; P < .05).

4.5.2.7 Health care workers (HCWs) categories who sustained needle stick injuries (NSIs) due to suture needles: 95% confidence interval for the percentage difference (n=21)

The 95% confidence interval for the percentage difference of health care workers (HCWs) categories that were injured by suture needles is presented in Table 4.24 below. There was a statistically significant difference in the percentages of doctors and professional nurses [9.0%:49.0%], doctors and auxiliary nurses [10.2%:54.7%] as well as doctors and general assistants [18.3%:60.4%] who were injured by suture needles.

Table 4.24: Health care workers (HCWs) categories who were injured by suture needles: 95% confidence interval for the percentage difference (n=21)

Categories of health care workers (HCWs)	95% Confidence interval
Doctors *versus* Professional nurses	[9.0%:49.0%]*
Doctors *versus* Staff nurses	[-1.5%:60.4%]
Doctors *versus* Auxiliary nurses	[10.2%:54.7%]*
Doctors *versus* General assistances	[18.3%:60.4%]*
Professional nurses *versus* Staff nurses	[-30.9%:29.7%]
Professional nurses *versus* Auxiliary nurses	[-17.8%:23.9%]
Professional nurses *versus* General assistants	[-9.6%:29.7%]
Staff nurses *versus* Auxiliary nurses	[-29.8%:37.1%]
Staff Nurses *versus* General assistants	[-21.5%:43.4%]
Auxiliary nurses *versus* General assistants	[-15.6%:29.8%]

* Statistically significant difference

The percentage of doctors injured by suture needles is significantly higher than that of the other categories however there were differences, though not statistically significant, between other HCWs categories.

Gańczak *et al*. (2006:175-180) conducted a study out of seven hospitals (2 academic and 5 municipal) in the city of Szczecin Poland, on occupational exposures to blood borne viruses (BBV). The study period was from January to March 2003 amongst 601 nurses. Of the 601 nurses surveyed, 165 (27.5%) had at least 1 exposure to potentially infectious material during the month before completion of the questionnaire. Hollow bore needles caused injury in 202 nurses (69.9%), whereas injury caused by an instrument was 61 (21.1%), and a suture needle 26 (9.0%). The most recent exposure in 236 was often injuries (81.7%) self inflicted. The 73.0%f nurses (211) sustained exposure while

working in the wards; in the remaining cases, exposure occurred in the operating room (24%) and the admitting area (3%). More than half injury 154 (53.3%) of such exposures occurred during elective procedures.

4.5.2.8 Health care workers (HCWs) categories who sustained needle stick injuries (NSIs) via other needles: Percentage (n=12)

Twelve (12) of the HCWs categories who sustained needle stick injury (NSI) via other needles are depicted in Figure 4.15. The other devices are amongst others jelco-, spinal-, butterfly-, central venous pressure-, and vacutainer needles as well as lancets. Of the four doctors (8.33%) each one sustained a NSI caused by jelco, spinal-, butterfly- and central venous pressure needles respectively. While two professional nurses sustained NSIs due to jelco needles (16.67%) while one (8.33%) professional nurse sustained NSI via vacutainer-, lancet-, and butterfly needles respectively. Auxiliary nurses (16.67%) sustained injuries by lancets and one general assistant (8.33%) by a butterfly.

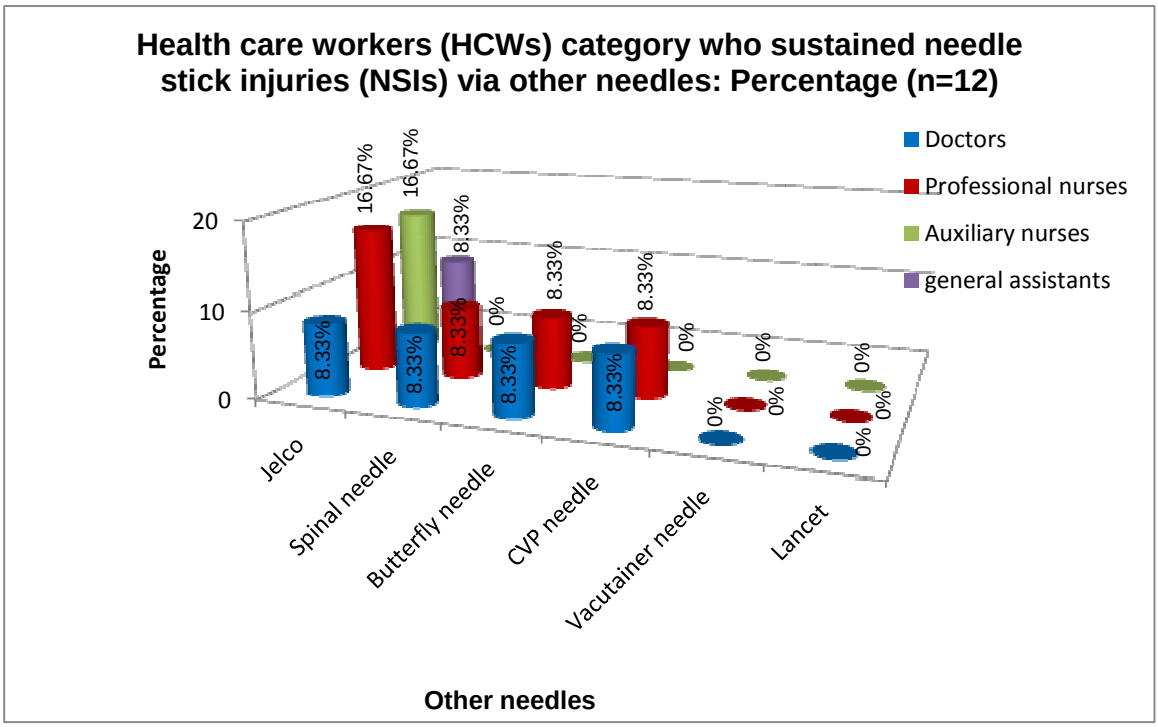


Figure 4.15: Health care workers (HCWs) categories who sustained needle stick injuries (NSIs) by other needles: Percentage (n=12)

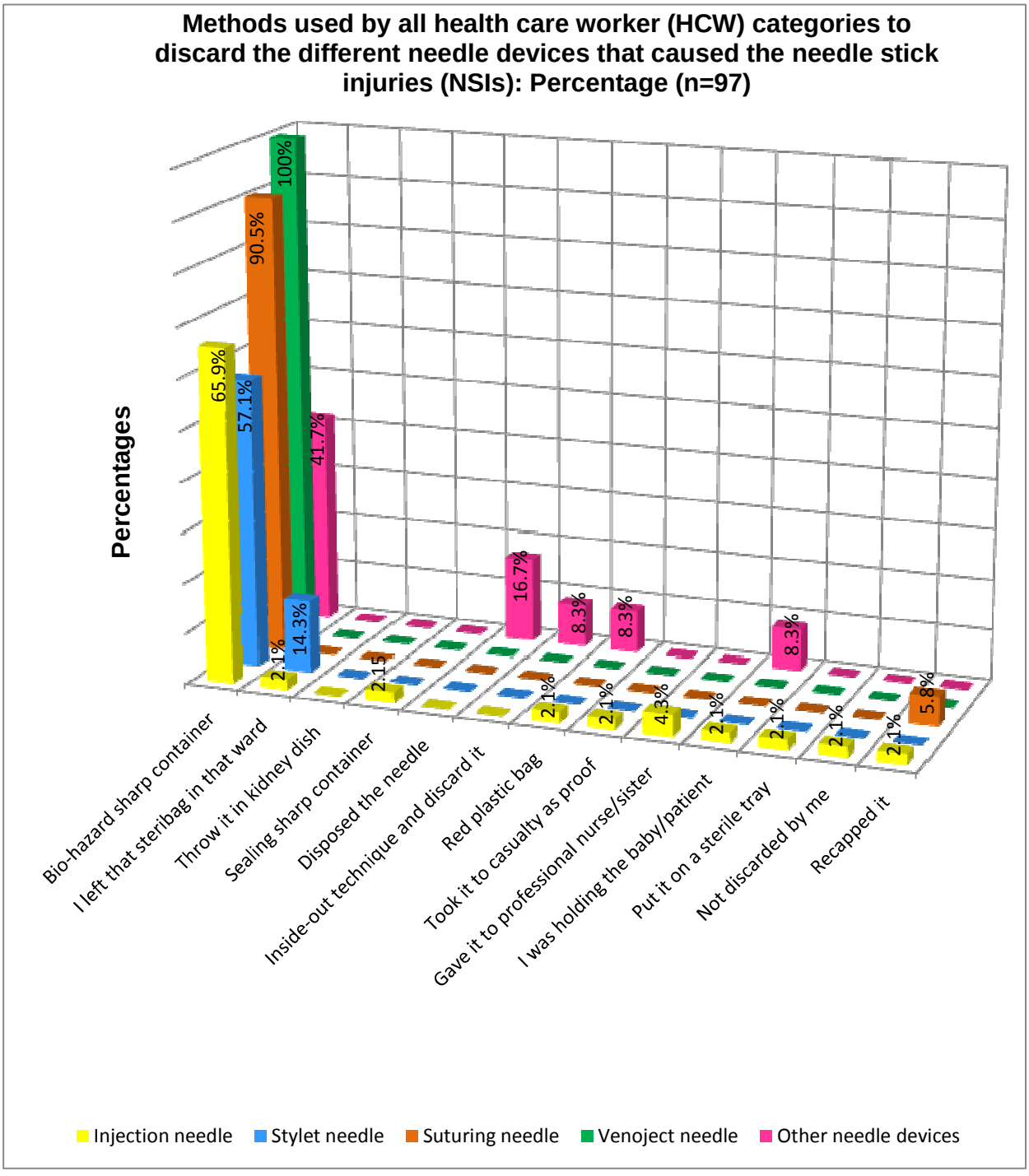
Saulat (2005:233–238) conducted a retrospective survey of 73 self reported needle stick injuries (NSIs), for the period January 2002 to December 2003 in a 212 bed secondary care hospital in Buraidah, Saudi Arabia. There were 34 (46.57%) injuries in 2002 and 39 (53.43%) injuries in 2003. Twenty-nine (39.7%) of the reported injuries occurred during clinical procedures (surgery, IV-line-related, restless patient and handling/passing device) during the time of needles and sharp objects usage. While 44 (60.3%) of the injuries occurred after use and 39 (53.4%) after a clinical procedure but before disposal related to (recapping, collision with sharp object and while disposing the sharp object). Five (6.8%) occurred after disposal (concealed sharps). Amongst physicians, most of the injuries occurred while suturing or doing a surgical procedure, while nurses sustained a needle stick injury while recapping a needle, disposing of a used needle, injecting medicine, or drawing blood. Sanitary staff had sustained NSIs while disposing of garbage in the majority of cases. Syringe needles were responsible for 46 (63%) of the injuries, stylet of cannula for 10 (13.7%), suturing needles for 11 (15.1%) and 6 (8.2%) of the injuries were caused by other sharps like k-wire, fistula needle and surgical blades.

4.5.2.9 Methods used by health care workers (HCWs) to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=97)

The methods used by the different health care workers (HCWs) categories to discard the different needle devices (Injection-, Stylet -, Suturing -, Venoject - and other types of needles) that caused the needle stick injury (NSI) are presented in Figure 4.16. Health care workers who reported that they discarded the injection needle into a bio-hazard sharps container were (65.9%:n=31), while only two indicated that they did not discard the injection needle but gave it to the professional nurse/sister (4.3%:n=2). The following was the responses obtained from the HCWs: 1 respondent indicated that s/he was sealing the sharp container when the injury occurred while one was placing the injection needle into a red plastic bag (2.1%:n=1). Other HCW indicated that s/he took the injection needle to casualty department as a proof (2.1%:n=1); while one indicated that s/he was holding a baby (2.1%:n=1) when the injury occurred; the other indicated

that s/he put the injection needle into a sterile tray (2.1:n=1). One respondent indicated that the injection needle was not discarded by her/him (2.1%:n=1), and one (2.1%:n=1) was recapping the injection needle when injury occurred. Six HCWs reported that they were injured by an injection needle (see Question 24), though they did not indicate the method used to discard it.

Four health care workers (HCWs) (57.1%) who were injured by a stylet needle indicated that they discarded it into a bio-hazard sharps container while only one indicated that s/he discarded the needle in a steri-bag in the ward were (14.3%:n=1). HCWs who sustained NSI while suturing discarded the needle device in the bio-hazard sharps container were (90.5%:n=19) while one (5.8%:n=1) recapped it. Ten health care workers (HCWs) who were injured by a venoject needle device, (100%:n=10) discarded it in the bio-hazard sharp container. Lastly, HCWs who were injured by the other types of needle devices (jelco-, spinal-, butterfly-, central venous pressure-, and vacutainer needles as well as lancets), five (41.7%:n=5) indicated that they discarded it in a bio-hazard sharp container, while those who indicated that they disposed it, but did not indicate the method, were (16.7%:n=2). One HCW (8.3%:n=1) indicated that s/he used the inside-out technique and discarded the device, but did not indicate where it was discarded. One HCW (8.3%:n=1) indicated that s/he was holding a baby when sustaining the needle stick injury (NSI). Two of the HCWs (16.7%:n=2) indicated the type of devices that injured them but did not indicate the method used to discard the devices.

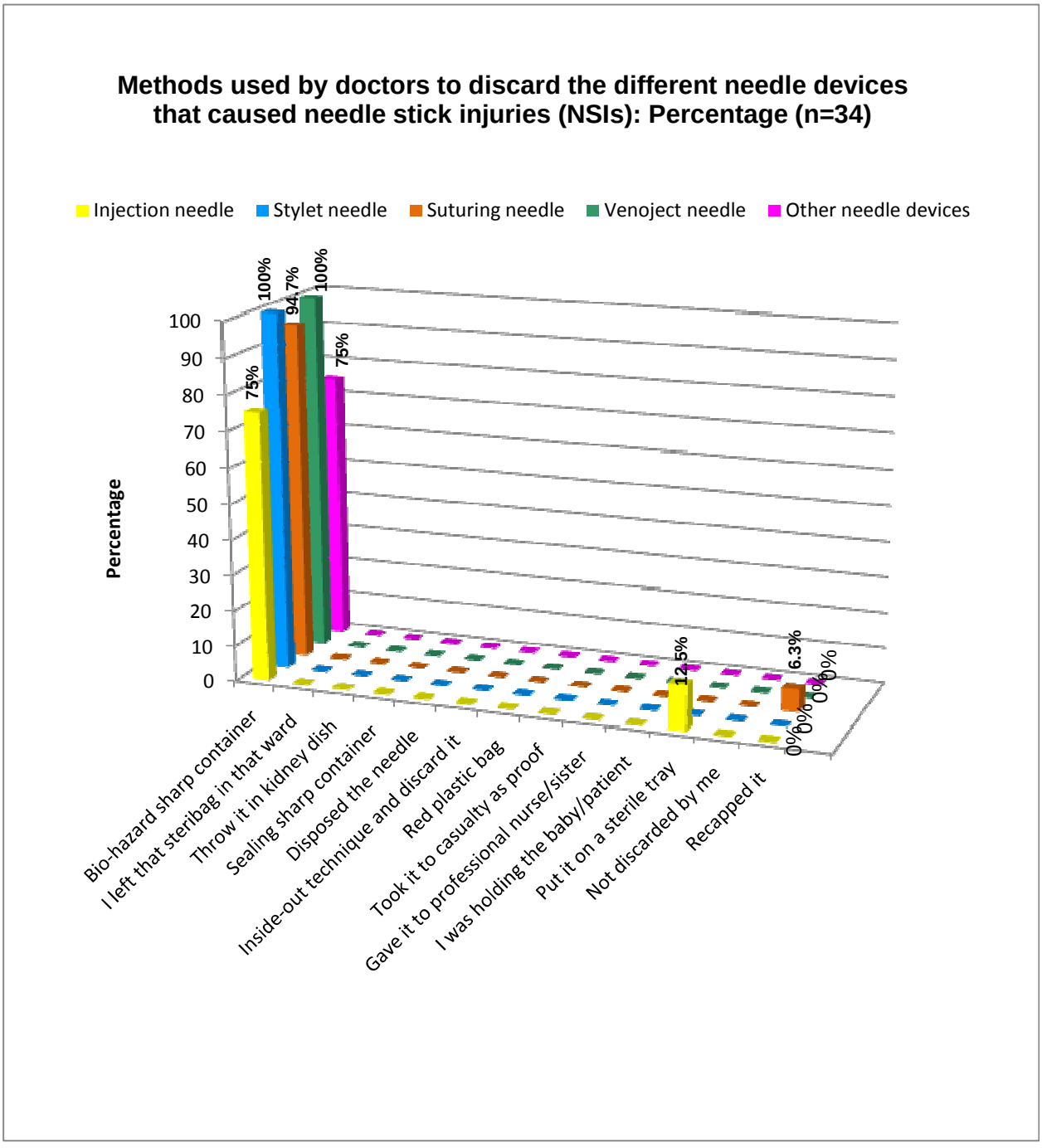


Three health care workers (HCWs) did not respond to the question

Figure 4.16: Methods used by health care workers (HCWs) to discard the different devices that caused needle stick injuries (NSIs): Percentage (n=97)

4.5.2.10 Methods used by doctors to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=34)

Methods used by doctors to discard the devices that caused needle stick injuries (NSIs) are depicted in Figure 4.17. Amongst the doctors six were injured by injection needles, (75%:n=6) and discarded the needle in the bio-hazard sharps bin container, one doctor (12.5%:n=1) indicated that s/he put it on a sterile tray, while three doctors (100%:n=3) indicated that they were injured by a stylet needle and discarded it in the bio-hazard sharps bin container. Sixteen doctors who were injured by suture needles discarded it in the bio-hazard sharps bin container (100%:n=16), while three were injured by a venoject needle and reported that they discarded it in the bio-hazard sharps bin container (100%:n=3) and (75%:n=3) doctors who were injured by other needle devices (jelco-, spinal-, butterfly-, central venous pressure-, and vacutainer needles as well as lancets) (see Figure 4.15), indicated that they recapped the needle but did not indicate where it was discarded. Two doctors indicated the devices that caused needle stick injuries were an injection- and suturing needle, but they did not indicate where they discarded the needles, while two did not answer of the questionnaire (Question 24).



Two doctors did not respond to the question

Figure 4.17: Methods used by doctors to discard the different devices that caused needle stick injuries (NSIs): Percentage (n=34)

4.5.2.11 Methods used by professional nurses to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=30)

Methods used by professional nurses to discard the different needle devices that caused needle stick injuries (NSIs) are depicted in Figure 4.18. Those professional nurses who were injured by injection needles (53.3%:n=8) discarded the injection needles in the bio-hazard sharps bin container. One professional nurse indicated that s/he was sealing the sharps container when injured by an injection needle (6.7%:n=1). One indicated that s/he discarded the injection needle into a red plastic bag, while one indicated that the injection needle was not discarded by her/him (6.7%:n=1) and one professional nurse indicated that s/he recapped the injection needle. One professional nurse who was injured by a stylet needle discarded it in the bio-hazard sharps bin container (50%:n=1). Three professional nurses who were injured by suture needles discarded it in the bio-hazard sharp bin container (75%:n=3), while one discarded the suture needle in a kidney dish (25%:n=1). Four professional nurses injured by a venoject needle devices, indicated that they discarded the venoject needle devices in the bio-hazard sharps bin container (100%:n=4). The two professional nurses who were injured by the other needle devices (jelco-, spinal-, butterfly-, central venous pressure-, and vacutainer needles as well as lancets), indicated that they discarded it in the bio-hazard sharps bin container (40%:n=2), while one (20%:n=1) indicated that s/he disposed the needle but did not indicate where and one was holding the baby when the injury was sustained (see Figure 4.15).

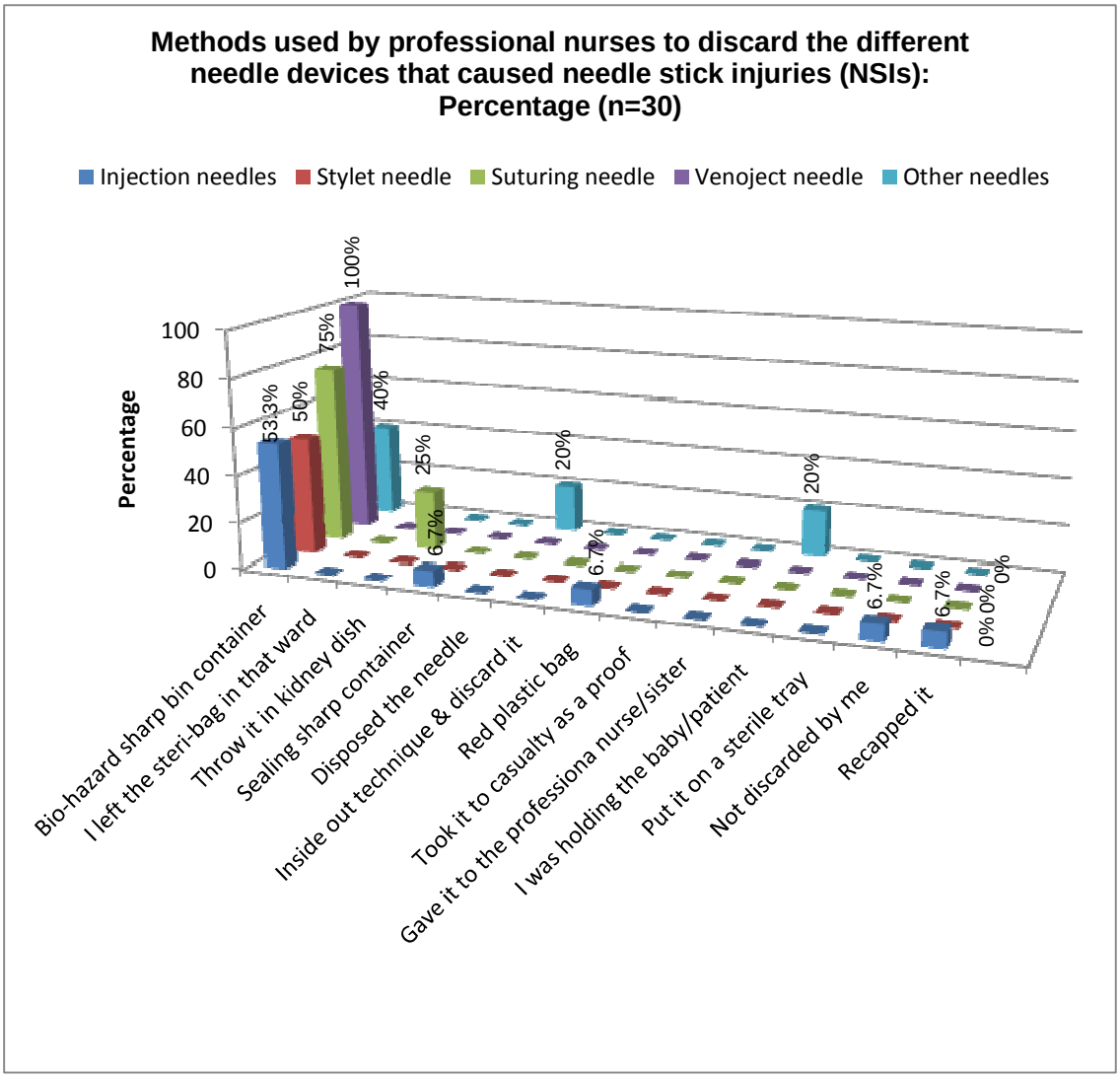


Figure 4.18: Methods used by professional nurses to discard the needle devices that caused needle stick injuries (NSIs): Percentage (n=30)

4.5.2.12 Methods used by staff nurses to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=5)

Methods used by staff nurses to discard the different needle devices that caused needle stick injuries (NSIs) are depicted in Figure 4.19. Staff nurses were injured only by injection- and suture needles. Four staff nurses (100%:n=4) were injured by injection needles discarded the injection needles in the bio-hazard sharps bin container. The one (100%:n=1) staff nurse who reported being injured by a suture needle discarded it in the bio-hazard sharp bin container.

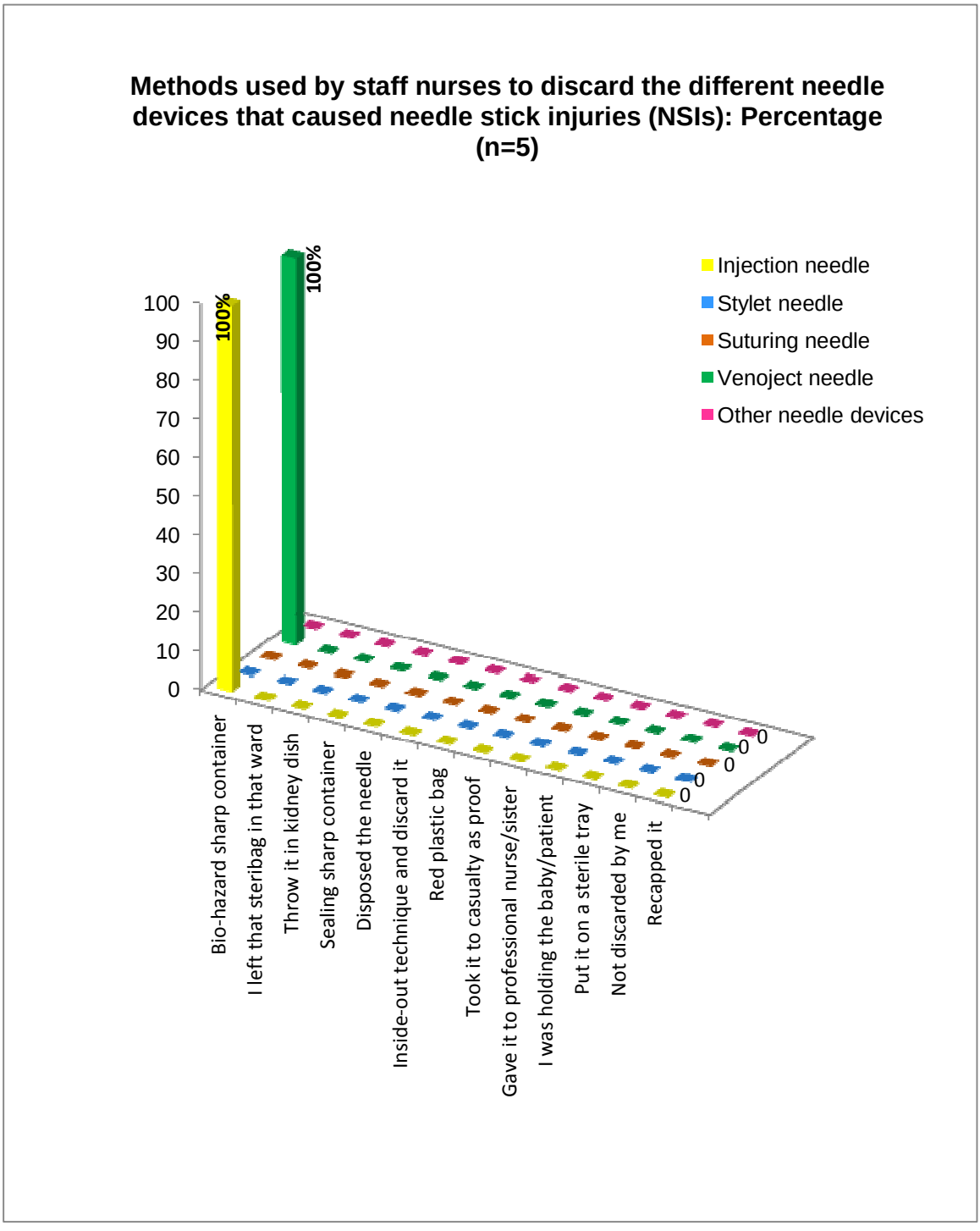
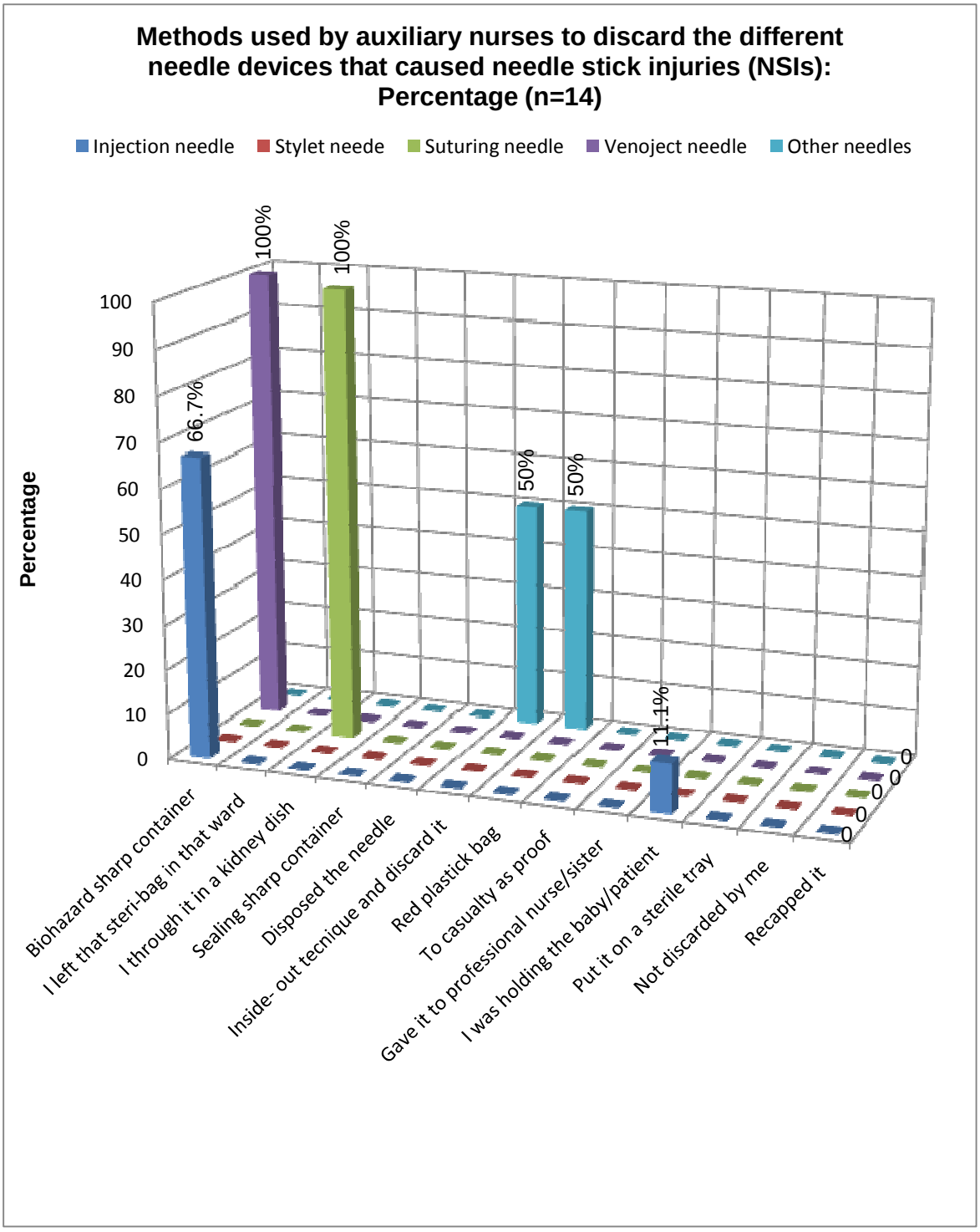


Figure 4.19: Methods used by staff nurses to discard the needle devices that caused needle stick injuries (NSIs): Percentage (n=5)

4.5.2.13 Methods used by auxiliary nurses to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=14)

Methods used by auxiliary nurses to discard the different needle devices that caused needle stick injuries (NSIs) are depicted in Figure 4.19. Six out of nine auxiliary nurses (66.7%:n=6) who were injured by injection needles discarded the injection needle in the bio-hazard sharp bin container. Other injuries sustained by one auxiliary nurse (11.1%:n=1) happened while holding the baby/patient, so the needle was not discarded by the injured HCW. One auxiliary nurse (100%:n=1) who was injured by a suturing needle, discarded the needle in a kidney dish, while one auxiliary nurse (100%:n=1) who was injured by a venoject needle discarded it in the bio-hazard sharp bin container. Of the two auxiliary nurses who were injured by other types of needles (jelco-, spinal-butterfly-, central venous pressure-, and vacutainer needles as well as lancets) (see Figure 4.15), one auxiliary nurse (50%:n=1) indicated that s/he used the inside-out technique and discarded it (did not indicate where), while (50%:n=1) discarded the needle in a red plastic bag, one (50%:n=1) indicated the needle that injured her/him but did not indicate the method used to discard it, while one auxiliary nurse (50%:n=1) did not respond regarding which needle injured her/him.



One auxiliary nurse did not respond

Figure 4.20: Methods used by auxiliary nurses to discard the different needle devices that caused needle stick injuries (NSIs): Frequency and percentage (n=14)

4.5.2.14 Methods used by general assistants to discard the different needle devices that caused needle stick injuries (NSIs): Percentage and frequency (n=14)

Methods used by general assistants to discard the different needle devices that caused needle stick injury (NSI) are depicted in Figure 4.21. Seven general assistants (63.6%:n=7) who were injured by injection needles discarded the needles in the bio-hazard sharps bin container, while one (9.1%:n=1) left it in the steri-bag in that ward. One general assistant (9.1%:n=1) took it to casualty as proof, while two (18.2%:n=2) gave it to a professional nurse/sister. One general assistant (100%:n=1) who was injured by a stylet needle, left it in the steri-bag in the ward. One (100%:n=1) who was injured by a venoject needle discarded it in the bio-hazard sharps bin container and one (100%:n=1) who was injured by other type of needles (jelco-, spinal-butterfly-, central venous pressure-, and vacutainer needles as well as lancets) (see Figure 4.15), disposed of the needle but did not indicate the method that was used to discard the needle.

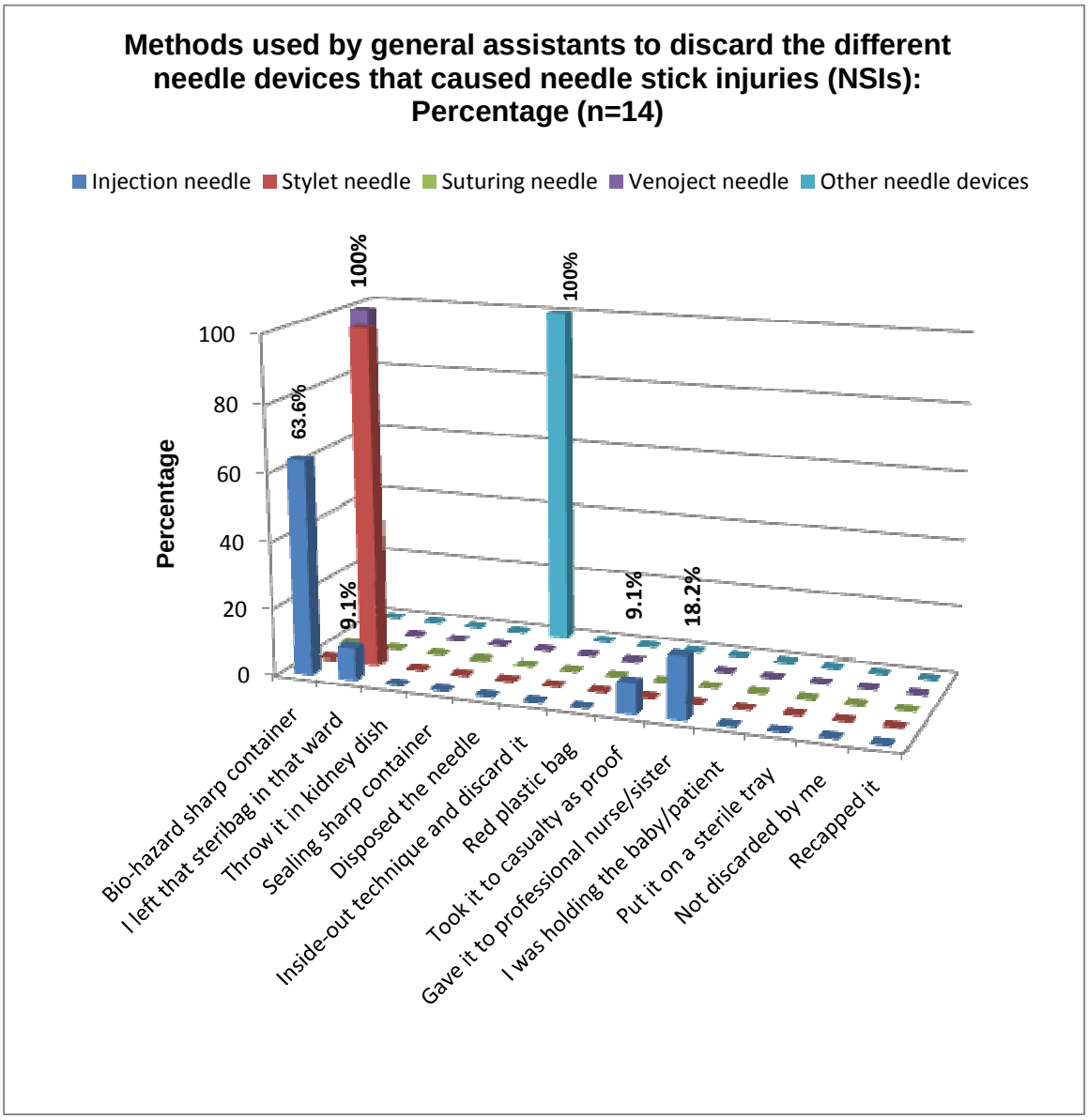


Figure 4.21: Methods used by general assistants to discard the different needle devices that caused needle stick injuries (NSIs): Percentage (n=14)

The researcher did an intense literature search on the question on the method/s used by health care worker (HCW) categories to discard the different needle devices that caused needle stick injuries (NSI), but could not find relevant information. The literature found was regarding the disposal of used needles but not on methods. The website Nursing for nurses (2005:Online) had online questions for HCWs to answer on “what’s the straight Dope on recapping needles?”. There were several responses, amongst

others, some HCWs indicated that “… we have the safety devices and I utilize those, or if they're not available I use a small dish and throw the used needle in there and then just empty the whole dish into the sharps box”. Another response was “….. I was always taught to draw up with one needle, and then use a fresh needle to inject the patient with...hence no recapping issues. I always use a small dish when taking blood or giving injections. That way I always have something to throw my needle into”. Another response was “… when drawing up and using anaesthetics while scrubbed, we recap between drawing up and administration and/or between administrations (if there are more than one). For anaesthesia, recapping is a way of life. I do my best not to recap “… however, most instructors say don't recap, and then go on to demonstrate the "scoop" technique of recapping with the cap on the table. Many nurses say they feel they need to recap because otherwise they are walking to the hazardous disposal bin with an uncapped needle that could injure someone”.

Stoker (2007:Online) on the guideline for Strategies for Creating a Safe Workplace, estimated that recapping needles can account for 25% to 30% of needle stick injuries (NSIs) to nursing and laboratory staff. It was further indicated that the non-compliance practices could be due to a variety of excuses given when a health care worker (HCW) is caught recapping the needle. One of the most common reasons for recapping given is that HCWs would indicate that they wanted to protect themselves when several items were carried to a sharps disposal container in a single trip. Another reason given was to protect other HCWs from needle stick injury (NSI) in crowded conditions on the way to the sharps container. The gowns, gloves and other soiled articles should be thrown away immediately following use or after protection against exposure to blood and body fluids. They can be thrown into regular trash if there is no visible blood but when blood is visible they should be thrown into a red container.

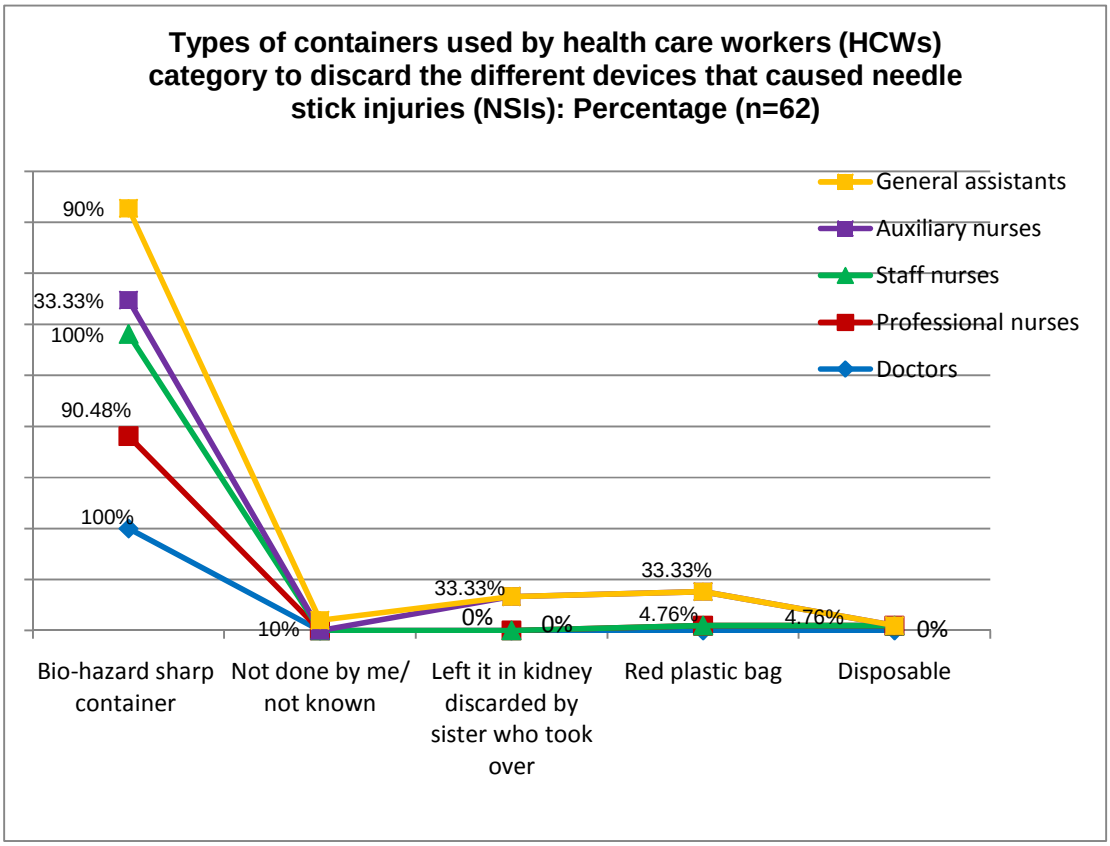
In a study done at Kathmandu Medical college by Gurubacharya *et al*. (2003:91-94) on knowledge, attitude and practices among health care workers (HCWs) on needle-stick injuries (NSIs), it was documented that out of 70 study participants, 55 (79%) were of the impression that needles should be recapped after use. Those who indicated that

needles should not be recapped were (21%:n=15). The recapping of needles has been prohibited under the Occupational Safety and Health Administration (OSHA) blood borne pathogen Standard 2000.

The Health Protection Agency (2008:Online) did a surveillance of significant occupational exposures to blood borne viruses (BBV) in health care workers (HCWs) in the United Kingdom. In the report presented by McCracken, a total of 2296 percutaneous exposures were reported for the period 2000-2007. For the period 2004-2007 235 (38%) of incidents were sustained in the ward, while 60 (37%) in Accident and Emergency (A&E), 25 (22%) in intensive care and 46 (21%) in operating theatres; all occurred after the procedure. Such incidents included injuries sustained before disposal whilst recapping the needle, while disassembling the device, as a result of items left on or near disposal containers, or injured while in transit to the rubbish disposal and cleaning area. Injuries sustained that occurred during or after disposal of needle devices, resulted from putting needle device items into disposal containers, while clearing devices left on the floor, table or bed, and from sharps protruding from sharps containers as a result of inappropriate waste disposal and items piercing the side of sharps boxes.

4.5.2.15 Types of containers used by health care workers (HCWs) categories to discard the different devices that caused needle stick injuries (NSIs): Frequency and percentage (n=62)

The types of containers used to discard the different devices that caused the needle stick injury are presented in Figure 4.22. All doctors (100%:n=26), professional nurses (90.48%:n=19), all staff nurses (100%:n=2), auxiliary nurses (33.33%:n=1) and general assistants (90%:n=9) threw the different devices that caused needle stick injury (NSI) in a biohazard sharps container. Those who threw the devices into a red plastic bag after needle stick injury (NSI) were professional nurses (4.76%:n=1), and auxiliary nurses (33.33%:n=1), while by one general assistant (10%:n=1) reported that the device was not discarded by her/him. One professional nurse (4.76%:n=1) reported that s/he disposed of the needle but did not indicated where or in what type of container.



One doctor, two professional nurses, one auxiliary nurse and one general assistant did not respond

Figure 4.22: Types of containers used by health care workers (HCWs) categories to discard the different devices that caused needle stick injuries (NSIs): Frequency and percentage (n=62)

Bhat, Patnaik, Pratinidhi, Gupte and Desai (2004:143-144) conducted a study on the knowledge and awareness amongst nursing students regarding the risk of HIV infection through accidental needle stick injury (NSI). The study participants (n=290) included 106 first- 94 second- and 90 third year nursing students from Sassoon General hospital in Pune. One of the assessments was on the knowledge and awareness regarding methods of disposal of used disposable needles and syringes. The methods of disposal as described are depicted in the table 1 of the literature study.

Table 1: Methods of disposal of used disposable needles and syringes

Method of disposal	First Year		Second Year		Third Year		Total	
	f	%	f	%	f	%	f	%
Disposal in puncture resistant container with disinfectant	11	10.3	55	58.5	82	91.1	147	51.0
Bend the needle and throw in the dust bin	55	51.8	17	18.16	3	3.3	75	25.9
Throw in the dustbin directly	37	34.9	18	19.14	1	1.2	56	19.4
Recap the used needle	3	2.8	4	4.2	4	4.4	11	3.7
Total	106	100	94	100	90	100	290	100

Source: Indian Journal of Community Medicine: Volume XXIX No 3 July-September 2004 (Bhat, Patnaik, Pratinidhi, Gupte & Desai, 2004:143-144).

4.5.3 SECTION C: MANAGEMENT OF NEEDLE STICK INJURIES (NSIs) (n=100)

Section C on the questionnaire consisted out of sixteen (16) questions dealing with management of needle stick injuries (NSIs). Eight (8) questions were closed while another eight (8) were open ended questions.

4.5.3.1 Immediate action that different health care workers (HCWs) categories took to the injured area after the needle stick injuries (NSIs) occurred: Percentage and frequency (n=100)

Table 4.25 depicts the immediate action/s taken by HCWs to the injured area after needle stick injury/ies (NSIs). A third of the doctors (33.3%:n=12), five professional nurses (16.7%:n=5), one staff nurse (20.0%:n=1), four auxiliary nurses (26.7%:n=4) and three general assistants (21.4%:n=3) washed their hands/finger. On the other hand doctors (36.1%:n=13), professional nurses (60%:n=18), staff nurses (60%:n=3), auxiliary nurse (53.3%:n=8) and general assistants (50%:n=7) rinsed the inflicted area under running tap water after the occurrence of a needle stick injury (NSI).

Table 4.25 Immediate action taken by different health care workers (HCWs) categories to the injured area after the needle stick injuries (NSIs): Frequency and percentage (n=100)

Action taken to the area after a needle stick injury (NSI)	Doctors (n=36)		Professional nurses (n=30)		Staff nurses (n=5)		Auxiliary nurses (n=15)		General assistants (n=14)	
	f	%	f	%	f	%	f	%	f	%
Washed my hands/ finger	12	33.3	5	16.7	1	20.0	4	26.7	3	21.4
Expressed blood from finger	22	61.1	26	86.7	5	100.0	9	60.0	10	71.4
Rinsed under running tap water	13	36.1	18	60.0	3	60.0	8	53.3	7	50.0
Removed the gloves	2	5.6	1	3.3	0	0.0	1	6.7	0	0.0
Applied a dressing	3	8.3	2	6.7	0	0.0	1	6.7	0	0.0
Rinsed with hibiscrub	6	16.7	2	6.7	0	0.0	2	13.3	0	0.0
Nothing as I was confused	0	0.0	0	0.0	0	0.0	1	6.7	1	7.1
Took blood from patient for HIV test	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
Gave it to the sister	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rub with preptic swab	0	0.0	1	3.3	0	0.0	0	0.0	1	7.1
Reported	0	0.0	1	3.3	0	0.0	0	0.0	1	7.1
Rinsed with alcohol	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
PEP- post exposure prophylaxis	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
Sprayed with hibitane solution	1	2.8	0	0.0	0	0.0	1	6.7	0	0.0
First aid management	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
Clean prick area	0	0.0	0	0.0	0	0.0	0	0.0	1	7.1

Doctors (61.1%:n-22/36), professional nurses (86.7%:n=26/30), all staff nurses (100%:n=5/5), auxiliary nurse (60%:n=9/14) and general assistants (71.4%:n=10/14) expressed blood from their finger post needle stick injury (NSI). Those health care workers (HCWs) who rinsed the injured area with hibiscrub, were doctors (16.7%:n=6/36), professional nurses (6.7%:n=2/30) and auxiliary nurses (13.3%:n=2/14). Regarding this question in the study some of the HCWs category took more than one action to the injured area after a NSI.

Policy and guidelines on immediate actions to be taken by health care workers (HCWs) to the injured area after the needle stick injury (NSI) is discussed by several authors as indicated in chapter two (See 2.12.1).

Singru and Banerjee (2008:26-30) conducted a cross sectional study amongst a total of 745 out of 830 health care workers (HCWs) in a teaching hospital at Mumbai, to assess exposure incidence of blood and body fluids for a period of twelve months. The HCWs who agreed to participate had a response rate of 89.76%, which included 238 resident doctors, 158 interns, 323 nurses and 26 medical technicians. Needle stick injury (NSI) accounted for (92.21%:n=225) while blood and body fluids were (7.79%:n=19). The majority, 82.03% of nurses (105) washed the injured site with soap and water after the injury, as well as 57.63% interns (34), while 66% resident doctors (33) and lastly 57.14% medical technicians (4) washed the injured site with soap and water.

Different authors, such as, Mijch, Price and Wright (2003:Online), Cummings (2003:Online) Gańczak *et al*. (2006:175-180) and Centers for Disease Control & Prevention (CDC) (2008:Online), wrote guidelines for the management of occupational exposure to blood borne pathogens (BBPs) (HBV, HCV & HIV) and post exposure prophylaxis (PEP). According to the authors, the following actions are to be taken immediately by health care workers (HCWs) to the injured area after the needle stick injury (NSI) occurred:

- “Encourage bleeding from the skin wound and wash the injured area with copious soapy water, disinfectant, scrub solution or water; or

- ❖ Flush exposed mucous membranes with water;
- ❖ Application of caustic substances such as bleach to wounds or skin is not recommended; or
- ❖ Antiseptics may be used for wound cleaning but the injection of antiseptic into the wound is not recommended;
- ❖ Do not apply caustic agents, or inject antiseptics or disinfectants into the wound;
- ❖ Report to the supervisor/infection control unit /employee health (occupational clinic);
- ❖ Follow the protocol as per hospital/institution".

Similarly, the University of Cape Town (UCT) Health and Safety Department with Groote Schuur hospital's Needle Stick Injury Policy (2004:1-12 & Online) and Singh (2004:1-4) indicated that the immediate clinical action to take after NSI include:

- ❖ Encouraging bleeding at the site of injury, do not apply pressure to the wound; allow it to bleed freely;
- ❖ If percutaneous exposure occur, bleeding should be encouraged by pressing around the injured site of the injury (but taking care not to press immediately on the injured site); it is best to do this under running tap water;
- ❖ Washing wound with soap and water, then drying the area;
- ❖ Cleaning the area with spirits or applying poviodine-iodine to the wound (at least with water, if no soap or spirits available);
- ❖ Informing the person in charge during office hours or line manager/report immediately to the person concerned;
- ❖ Identifying the patient involved (source) so that they can be evaluated for an infection;
- ❖ Getting a medical assessment; and
- ❖ Following the directions for policy on Post Exposure Prophylaxis.

4.5.3.2 The person to whom the different health care workers (HCWs) category reported to immediately after a needle stick injury (NSI): Frequency and percentage (n=100)

Table 4.26 depicts the person to whom the different health care workers (HCWs) reported to immediately after the needle stick injury (NSI) had occurred. Doctors (25%:n=9), staff nurses (40%:n=2), auxiliary nurses (20%:n=3) and general assistants (21.4%:3) reported to the matron in casualty department. Those who reported to the sister in charge in their wards/units or departments included auxiliary nurses (66.7%:n=10), professional nurses (33.3%:n=10), doctors (22.2%:n=8) and general assistants (42.9%:n=6). Professional nurses (30.0%:n=9), staff nurses (40%: n=2) and general assistants (21.4%:n=3) reported to their supervisors. Doctors (25.0%:n=9) reported to the co-doctor working with them during NSI occurrence, while out of 30 professional nurses (23.3%:n=7) and one doctor (2.8%:n=1) reported to the matron in charge of the ward. Lastly, those who reported to the occupational health clinic were doctors (8.3%:n=3), professional nurses (23.4%:n=7), a staff nurse (20%:n=1) and a general assistant (7.1%:n=1). Some HCWs reported the exposure to more than one person.

Table 4.26 **The person** to whom the different **health care workers (HCWs) categories reported to immediately after a needle stick injury (NSIs): Frequency and percentage (n=100)**

The person that health care workers (HCWs) reported to after needle stick injuries (NSIs)	Doctors (n=36)		Professional nurses (n=30)		Staff nurses (n=5)		Auxiliary nurses (n=15)		General assistants (n=14)	
	f	%	f	%	f	%	f	%	f	%
Matron in casualties	9	25.0	0	0.0	2	40.0	3	20.0	3	21.4
Sister in charge	8	22.2	10	33.3	1	20.0	10	66.7	6	42.9
Occupational health clinic (OHC)	3	8.3	7	23.4	1	20.0	0	0.0	1	7.1
My supervisor	1	2.8	9	30.0	2	40.0	1	6.7	3	21.4
Infection control nurse	0	0.0	0	0.0	0	0.0	0	0.0	2	14.3
Doctor	9	25.0	3	10.0	0	0.0	1	6.7	2	14.3
In charge theatre	4	11.1	1	3.3	0	0.0	0	0.0	0	0.0
No one	2	5.6	0	0.0	0	0.0	0	0.0	0	0.0
Matron in charge in the ward	1	2.8	7	23.3	0	0.0	0	0.0	0	0.0
Co-worker	0	0.0	1	3.3	0	0.0	0	0.0	1	7.1
Health and safety representatives	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0
Referral room	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
Casual member	1	2.8	0	0.0	0	0.0	0	0.0	0	0.0
Unit manager	0	0.0	0	0.0	0	0.0	0	0.0	1	7.1

Gershon, Pogorzelska, Qureshi and Sherman (2008:165-172) conducted a study on 72 home health care registered nurses (RNs) in New York State regarding the risk of percutaneous injuries. Out of the 152 completed self administered risk assessment questionnaires by RNs, it was confirmed that blood borne pathogens (BBPs) risk in non-hospital based registered nurses from home health care nurses was a concern. Nine (13%) of the home health care nurses experienced 10 needle sticks injuries (NSI) in the 12 month period before the study. Only 4 of the needle sticks injuries (NSIs) were formally reported to the nurse's employer.

In another study conducted by Alam (2002:396-399) on the knowledge, attitude and practices amongst health care workers (HCWs) on needle-stick injuries (NSIs) at the 100 bed Armed Forces Hospital, Sharourah, in January 2002. A total of 104 health care workers were directly exposed to blood products and needle-stick injuries (NSIs) while dealing with patients. Seventy (70) nurses and paramedical staff (67%) from different departments/wards of the hospital were surveyed. Fifty-two (52) subjects (74%) out of 70 had a history of NSI of those, 34 (67%) had 1- 2 pricks per year. Only 4 subjects (7%) reported the injuries to doctors to get post-exposure treatment; 48 (92%) had not reported.

4.5.3.3 The Period that health care workers (HCWs) categories reported the needle stick injury (NSI): Frequency and percentage (n=100)

Figure 4.23 depicts the period that health care workers (HCWs) category for reported the needle stick injury (NSIs). All categories (100%) of professional-, staff nurses, general assistants, doctors (83.33%:n=30) as well as auxiliary nurses (93.33%:n=14) reported the needle stick injuries (NSIs) immediately after occurrence. On the other hand, four doctors (11.1%:n=4) reported the NSI the following day whereas two doctors (5.56%:n=2) reported the NSI after the elapse of more than two days. One auxiliary nurse (6.67%:n=1) could not recall the time period that lapsed before s/he reported the needle stick injury (NSI).

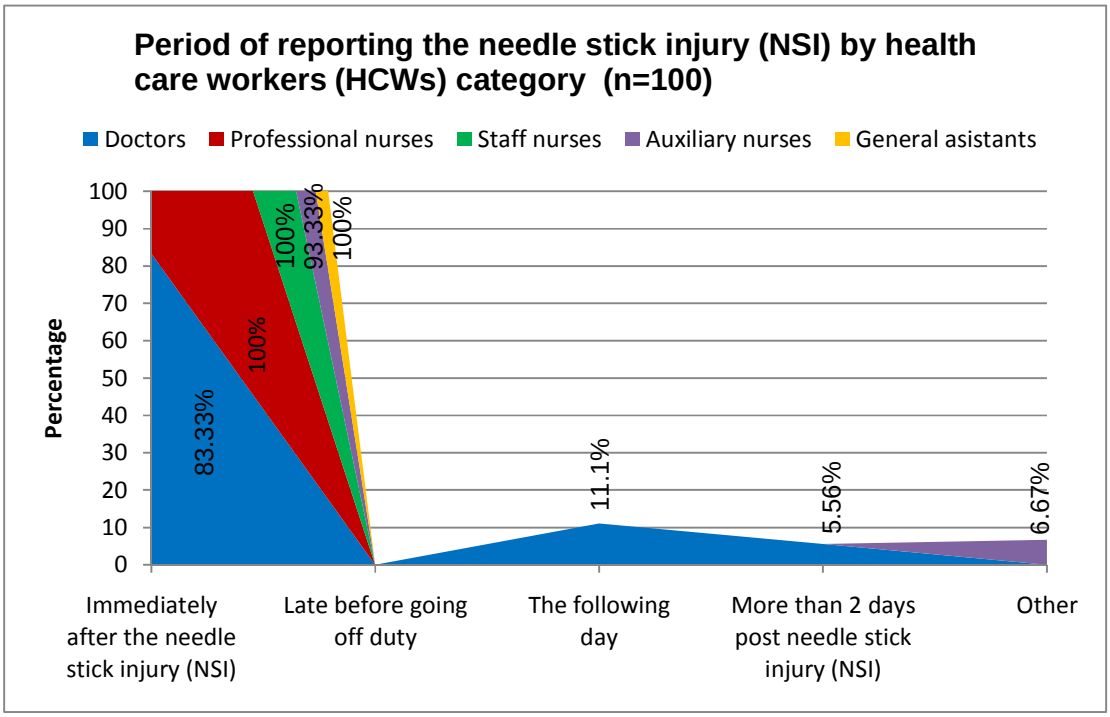


Figure 4.23: The Period that health care workers (HCWs) categories reported the needle stick injury (NSI): Percentage (n=100)

Jayanth, Kirupakaran, Brahmadathan, Gnanaraj and Kang (2009:44-47) did a study on needle stick injuries (NSIs) in a 2234 bed tertiary care hospital in India during the period July 2006-June 2007. There were 296 HCWs who sustained NSIs including 84 nurses (28.4%), 27 student/intern nurses (9.1%), while 45 were cleaning staff (15%). Doctors were 64 (21.6%), 47 interns (15.9%), 24 technicians (8.1%) and five other health care workers (HCWs) categories (1.7%). It was indicated that at least two thirds 202 (68.2%) of NSIs amongst HCWs was reported within one (1) hour after the injury occurred.

4.5.3.4 Health care workers (HCWs) categories who reported and did not report needle stick injuries (NSIs) to the occupational health nurse: Frequency and percentage (n=96)

The distribution of health care workers (HCWs) categories who reported (90.63%:n=87) or who did not report, namely (9.38%:n=9) needle stick injuries (NSIs) to the occupational health nurse is indicated in Table 4.27. Out of the study population of

(n=100) four HCWs (3 doctors and 1 professional nurse) did not give response to this question. Professional- (100%:n=29) and staff nurses (100%:n=5), as well as doctors (87.88%:n=29), auxiliary nurses (86.67%:n=13) and general assistants (78.57%:n=11) reported NSIs after the exposure.

Table 4.27 Health care workers (HCWs) category who reported and who did not report needle stick injuries (NSIs) to the occupational health nurse: Frequency and percentage (n=96)

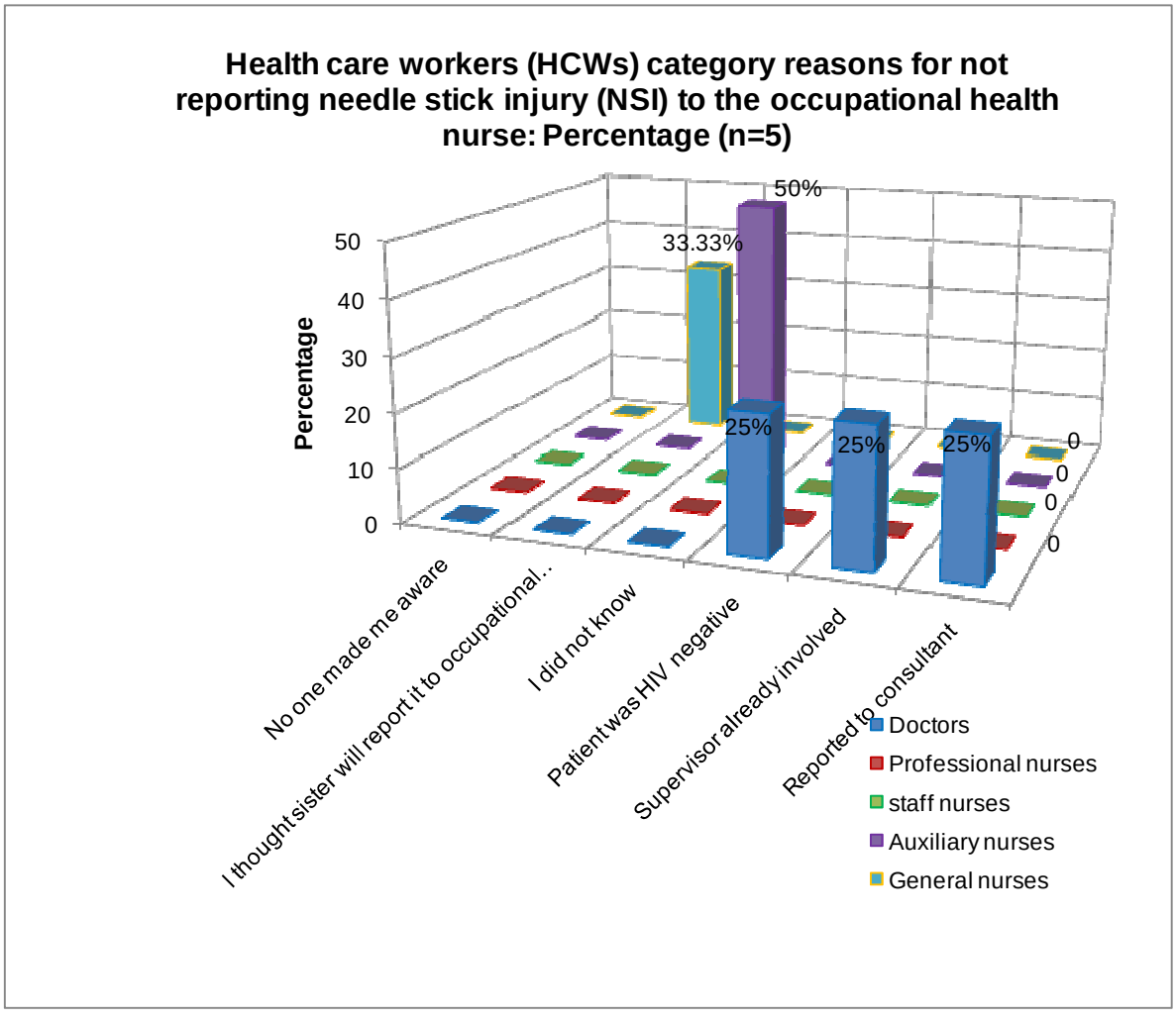
Categories of health care workers (HCWs)	Yes (n=87)		No (n=9)	
	f	%	f	%
Doctors (n=33)	29	87.88	4	12.12
Professional nurses (n=30)	29	100.0	0	0.0
Staff nurses (n=5)	5	100.0	0	0.0
Auxiliary nurses (n=15)	13	86.67	2	13.33
General assistants (n=14)	11	78.57	3	21.43

Three doctors and one professional nurse did not respond to this question

Sanchez-Ortiz (2007:2693-2699) as cited in Makary, Al-Attar, Holzmueller, Syin, Gilson Sulkowski and Pronovost (2007:Online) did a study on needle stick injuries (NSIs) amongst surgical residents in training at Baltimore. A total of 733 surgical residents in 17 medical centers were confidentially asked about previous needle sticks injury (NSI). The overall physicians' response rate was 95% (n=699). Questions included information on occurrence of needle sticks injury (NSI), whether patient was "high risk" for HIV, Hepatitis B- and Hepatitis C virus, as well as whether the needle stick injuries (NSIs) was reported to the Employee Health Clinic. Fifty three percent of the physicians (n=699) had NSI exposure from "high risk" patients. Of all exposures that had occurred, only 297 out of 578 (51%) reported to the Employee Health Clinic while only 16% of high risk exposures were reported. Lack of time was indicated by physicians as the main reason for not reporting the exposure.

4.5.3.5 Reasons given by health care workers (HCWs) categories for not reporting needle stick injuries (NSIs) to the occupational health nurse: Frequency and percentage (n=5)

The reasons for not reporting the needle stick injury to the occupational nurse are shown in Figure 4.24. Three doctors did not report the NSI to the occupational health nurse, with each (25%:n=1) giving the following reason: “the patient was HIV negative”, “the supervisor was already involved” and the other one indicated that s/he “reported to consultant”. One auxiliary nurse did not know that she has to report to the occupational health nurse and one general assistant thought that the sister will report on her behalf.



One doctor, one auxiliary nurse and two general assistants did not give a reason

Figure 4.24: Reasons given by h**ealth care workers (HCWs) categories reasons for not reporting needle stick injuries (NSIs) to the occupational health nurse: Percentage (n=5)**

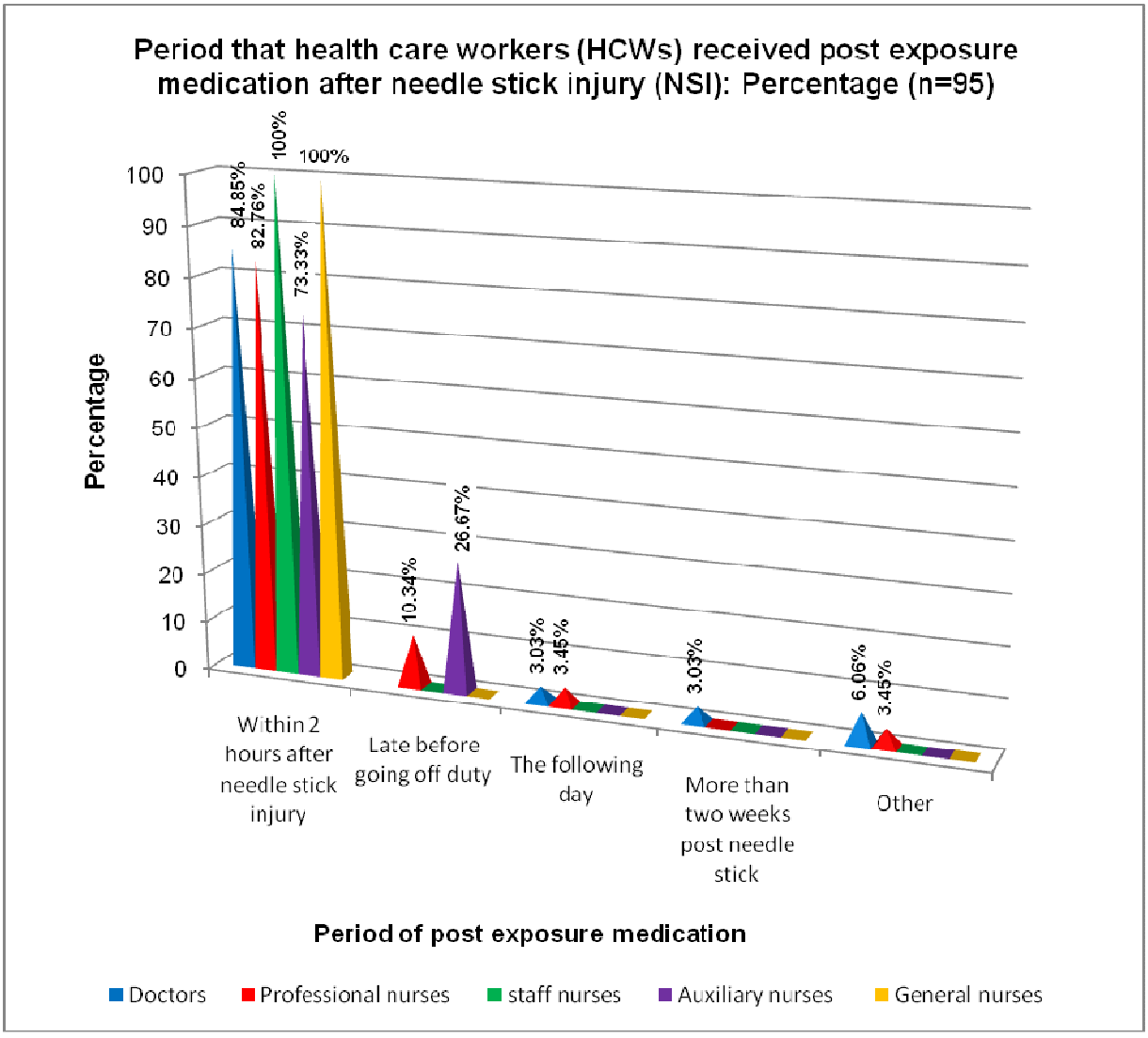
Gańczak *et al*. (2006:175-180) conducted a study amongst 601 nurses regarding occupational exposures to blood borne viruses (BBV) from surgical wards, operating rooms, and emergency departments in Poland. Out of the 601 study population, 215 (74.4%) did not report BBV exposure to the infection control center. The most common reasons for not reporting the NSI by the HCWs, were namely: the conviction that the source patient was not infected 82 (38.6%), while 59 nurses reported that, reporting would not result in avoiding infection (27.4%), 39 did not know how to report exposure (18.1%), 33 indicated that exposure was not significant (15.3%), another 32, reported that there was too little time to report (14.9%), while some 15 indicated that there was concern about confidentiality (14.9%) and 7 indicated that there was no medical centre where exposure could be reported (3.3%).

Carter (2007:Online) indicated that half of the trainee surgeons in the United States (US) do not report NSIs. This was confirmed in the study conducted on 699 post graduate medical doctors in surgical training in 2003 at 17 United States (US) institutions. The most important reported reason given in the study population of 699 for not reporting was: "… a feeling of being rushed" 53%, while 51% "… did not think their injury could have been prevented" was another reason. The other reasons mentioned for not reporting to occupational health services were, "… it takes too much time" 42%, while over a quarter 28% said there was "… no facility for reporting their injuries".

4.5.3.6 The period that had lapsed before the health care workers (HCWs) categories received post exposure medication after a needle stick injury (NSI): Percentage (n=95)

Figure 4.25 depicts the period that had lapsed before the health care workers (HCWs) categories received post exposure medication after a needle stick injury (NSI). In this study the majority namely, (85%:n=85) received post exposure medication within two hours after the occurrence of a needle stick injury (NSI), while (8%:n=8) indicated that they received the post exposure medication late before going off duty. All staff nurses (100%:n=5) and general assistants (100%:n=14) as well as doctors (84.85%:n=28), professional nurses (82.76%n=24), and auxiliary nurses (73.33%:n=11) received post exposure medication within 2 hours after the needle stick injury (NSI). Only one doctor

(3.03%) and one professional nurse (3.45%) received the post exposure medication the following day. However two doctors (6.06%) received the post exposure medication more than two weeks after sustaining a needle stick injury (NSI).



Four doctors and one professional nurse did not respond

Figure 4.25: The period that lapsed before the health care workers (HCWs) categories received post exposure medication after needle stick injuries (NSIs): Percentage (n=95)

Kowalska, Firlag-Burkacka, Niezabitowska, Bakowska, Gizińska, Higersberger, Ignatowska, Karczewski, Pulik, Święcki and Horban (2006:789-794) conducted a study in an out-patient clinic of a hospital for infectious diseases in Warsaw, Poland in 2001-2002 (n=79) and 2003-2004 (n=298). The study evaluated the tolerability and

adherence to antiretroviral (ARV) post-exposure prophylaxis (PEP) after exposures to potentially infectious material amongst health care workers (HCWs). In 2001-2002 the HCWs mean waiting time from exposure to receiving post-exposure prophylaxis (PEP) was 6 hours 48 minutes, whilst the study for the period 2003-2004 reported that health care workers (HCWs) had to wait 5 hours 40 minutes before receiving post-exposure prophylaxis (PEP) was.

In another study done by the Chief Medical Officers' Expert Advisory Group on AIDS in London (2008:1-75 & Online) the extent of health care worker (HCW) exposure to patients with hepatitis B, hepatitis C or HIV infections in England, Wales and Northern Ireland between 2000-2007 were assessed. The study was conducted around 200 centers in England, where the initial reports 482 out of 956 indicated (50%) exposures to hepatitis C and 25% exposures to HIV (238) in co-infected source patients. Fifty seven percent 157 out of 276 health care workers (HCWs) commenced post exposure prophylaxis (PEP) after percutaneous exposure, 24% (66/276) following mucotaneous exposure while 18% (51/276) did not take PEP. Health care workers (HCWs) who commenced post-exposure prophylaxis (PEP) within an hour after exposure, was indicated by (38%:n=62/163) and (90%:n=147/163) overall started PEP within 24 hours. Only (3%:n=5/163) were reported to have started PEP after 72 hours.

4.5.3.7 Reasons given by health care workers (HCWs) categories for delay in taking post exposure medication after occurrence of a needle stick injury (NSI): Frequency and percentage (n=15)

The reasons given by the health care workers (HCWs) categories for the delay in taking post-exposure medication after needle stick injuries (NSIs) are shown in Table 4.28. Two doctors (40%), and two auxiliary nurses (50%) delayed taking post- exposure medication after NSI due to waiting for the blood results. While one doctor (20%) was not sure whether to take post-exposure prophylaxis (PEP) and another doctor (20%:n=1) reported that s/he refused to take PEP as well as one (20%) professional nurse. One professional nurses (20%) reported that there was no post-exposure prophylaxis (PEP) in the institution, while the another professional nurse, (20%:n=1) reported that there was no post-exposure prophylaxis (PEP) after hours. Counselling for

blood taking, for post-exposure prophylaxis and to see a doctor was one of the reason that delayed HCWs in taking post-exposure prophylaxis (PEP) after NSI as indicated by professional nurses (40%:n=2) and auxiliary nurse (25%:n=1). Another reported reason, namely, not knowing the procedure to follow after needle stick injury (NSI) was indicated by one auxiliary nurse (25%:n=1). Paper work or filling in of forms was indicated by one doctor (20%:n=1) as reason that delayed her/him to take post exposure medication after sustaining NSI. Some of the health care worker (HCW) category gave more than one reason for delay in taking post-exposure medication (PEP).

Table 4.28 Reason given by health care workers (HCWs) categories for delay in taking post exposure medication after a needle stick injury (NSI): Frequency and percentage (n=15)

Reasons for delay in taking post exposure medication	Doctors (n=6)		Professional nurses (n=5)		Staff nurses (n=0)		Auxiliary nurses (n=4)		General assistants (n=0)	
	f	%	f	%	f	%	f	%	f	%
Waited for blood results first	2	40.0	0	0.0	0	0.0	2	50.0	0	0.0
Follow the protocol	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Paper work (filling of forms)	1	20.0	0	0.0	0	0.0	0	0.0	0	0.0
Very reluctant to report, not sure to take post exposure prophylaxis (PEP)	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0
No post exposure prophylaxis (PEP) after hours	0	0.0	1	20.0	0	0.0	0	0.0	0	0.0
ARV not available in the institution	0	0.0	1	20.0	0	0.0	0	0.0	0	0.0
The nurse in out-patient department very busy	0	0.0	0	0	0	0.0	1	25.0	0	0.0
I refused to take treatment	1	20.0	1	20.0	0	0.0	0	0.0	0	0.0
Blood taking counseling for post exposure and to see doctor	0	0.0	2	40.0	0	0.0	1	25.0	0	0.0
Not knowing the procedure	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0
Referred to casualty	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0

Diprose, Deakin and Smedley (2000:767-770) undertook a study to assess how the lack of knowledge regarding the guidelines on post exposure prophylaxis (PEP) after the occurrences of needle stick injury (NSI) in HIV infected source patient may increase the risk of seroconversion. A total of 76 anaesthetists working for Southampton University hospital were interviewed, the response rate was 37 juniors (100%) and 39 consultants (98%). Out of the 76 anaesthetists, 10 (15%) indicated that following a needle stick injury (NSI) from an HIV prone infection PEP should be started within one (1) hour, while 67 (40%) believed that PEP could be delayed for 24 hours or more.

4.5.3.8 Health care workers (HCWs) categories who took and did not take post exposure medication after the occurrence of a needle stick injuries (NSIs): Frequency and percentage (n=100)

Table 4.29 depicts all health care workers (HCWs) categories that took and did not take post exposure medication after occurrence of a needle stick injury (NSI). Of the 100 health care workers (HCWs) in all categories the majority, namely 94% took post exposure medication after sustaining a needle stick injury (NSI), while 6% did not take it any PEP medication. All (100%) staff- (n=5) and auxiliary nurses (n=15) took post exposure medication followed by professional nurses (93.33%:n=28), then general assistants (92.86%:n=13) and lastly doctors (91.67%:n=33). On the other hand, (8.33%:n=3) doctors (6.67%:n=2) professional nurses and one general assistant (7.14) did not take post exposure medication after sustaining NSIs .

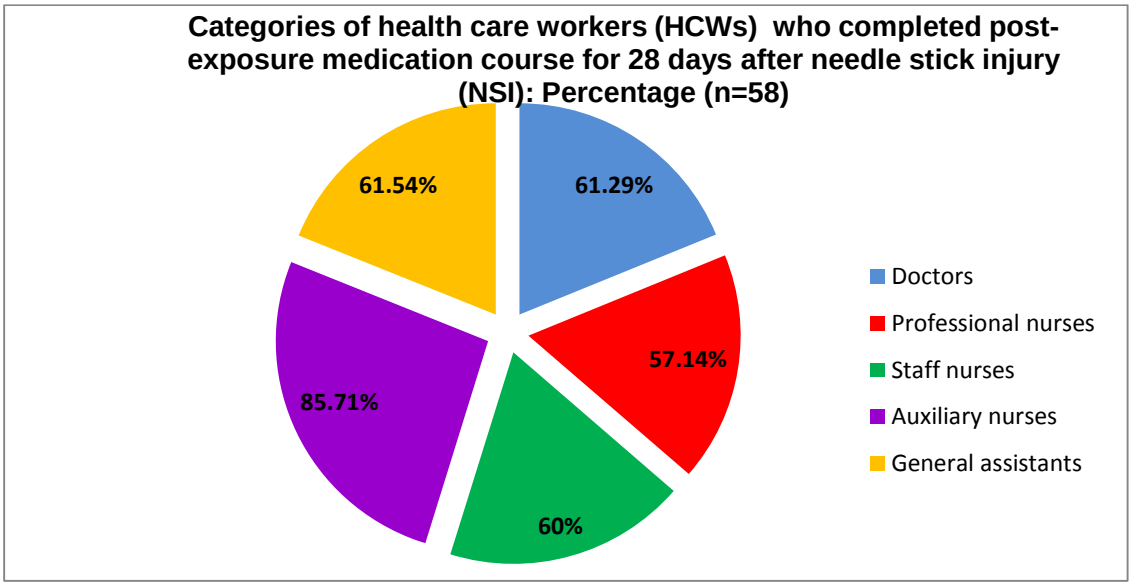
Table 4.29 Health care workers (HCWs) categories who took and did not take post exposure medication after sustaining a needle stick injuries (NSIs): Frequency and percentage (n=100)

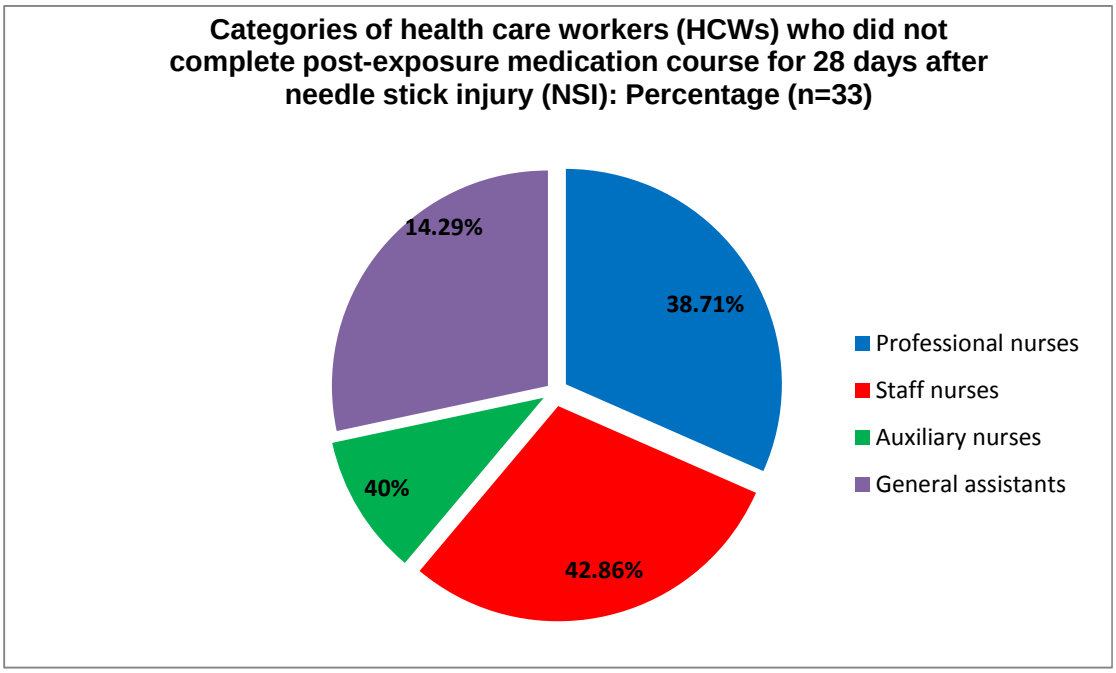
Categories of health care workers (HCWs)	Yes (n=94)		No (n=6)	
	f	%	f	%
Doctors (n=36)	33	91.67	3	8.33
Professional nurses (n=30)	28	93.33	2	6.67
Staff nurses (n=5)	5	100.0	0	0.0
Auxiliary nurses (n=15)	15	100.0	0	0.0
General assistants (n=14)	13	92.86	1	7.14

Perry, Robinson and Jagger (2004: 43–47) did a survey on nursing where readers in United States were invited to participate in a needle-stick and sharps-safety as reported in an article namely: “Getting to the point about preventable injuries”. The studied population was 498 nurses of whom the 60% were working in hospitals, while those working in other settings included long term care (13%), home health care (8%), offices (6%), and outpatient clinics (5%). Questions asked in the study to nurses included questions such as: “… If the sharps device had been used on a patient infected with human immunodeficiency virus (HIV), did you receive post exposure prophylaxis (PEP)”. Out of the total of 498, the majority (85%) did not receive post exposure prophylaxis (PEP) while only 15% reported that they did receive it. The authors of the article mentioned that

4.5.3.9 Health care workers (HCWs) categories who completed and did not complete the post-exposure medication for 28 days after sustaining a needle stick injury (NSI): Percentage (n=94)

Figure 4.26 shows the health care workers (HCWs) categories who completed and did not complete the post-exposure medication for 28 days after sustaining a needle stick injury (NSI). Of the 94 HCWs who indicated that they took post-exposure prophylaxis (PEP), (63.74%:n=58) completed the 28 days post-exposure medication while (36.26%:n=33) did not complete the course. The three HCWs (2 doctors and 1 auxiliary nurse) did not respond to this question. Auxiliary nurses (85.7%:12) were the highest number of individuals who completed the 28 days post-exposure prophylaxis (PEP) medication course, followed by general assistants (61.54%:n=8), doctors (61.29%:n=19), staff nurses (60%:n=3) and lastly professional nurses (57.14%:n=16).





Two doctors and one auxiliary nurse did not respond to this question

Figure 4.26: Categories of health care workers (HCWs) who completed and did not complete post-exposure medication course for 28 days after sustaining a needle stick injury (NSI): Percentage (n=94)

Wang *et al*. (2000:780-785) and the Human Immunodeficiency Virus (HIV) post-exposure prophylaxis (PEP) Registry Group, conducted a study at hospital occupational health clinics in United States on "Experience of health care workers (HCWs) pertaining to the taking of PEP after occupational HIV exposures and findings of the HIV post exposure prophylaxis registry". The study population was 492 HCWs who was exposed to HIV and had started PEP for any duration with negative baseline blood test for HIV. It was indicated that the intended duration of post-exposure prophylaxis (PEP) was 28 days. The majority of 43% (195) HCWs took post-exposure prophylaxis (PEP) regimens which consisted of three or more drugs, with a follow up of 6 weeks. 44% of HCWs (197) discontinued all post-exposure prophylaxis (PEP) drugs and did not complete a PEP regimen for 28 days. However, 13% (57) of HCWs discontinued one or more drugs, or added a drug whereby drug dosage was modified, they did however, completed a course of post-exposure prophylaxis (PEP) for 28 days.

Another study was done between 2000-2007 by the Chief Medical Officers' Expert Advisory Group on AIDS in London (2008:1-75) with the aim to assess the extent of health care worker (HCW) exposure to patients with hepatitis B virus (HBV), hepatitis C virus (HCV) or Immunodeficiency virus (HIV) infections in England, Wales and Northern Ireland. Of the 276 HIV exposed health care workers (HCWs) originally reported to the scheme, 58% (161) out of 276 were reported. Forty four percent 8 of those exposed to an unknown source HIV status (18), completed the 28 day course of post-exposure prophylaxis (PEP). A total of 23 (17%) HCWs exposed to an HIV positive source discontinued all or part of the PEP regimen before 28 days due to drug toxicity. It was also indicated that where PEP was initiated, but the source was found to be negative 52% (44) HCWs had discontinued PEP within a day, and 86%: (73) had stopped the PEP within 7 days or shorter (Chief Medical Officers' Expert Advisory Group on AIDS, 2008:1-75 & Online).

4.5.3.10 Reasons given by health care workers (HCWs) categories for not completing the post-exposure medication for 28 days after sustaining a needle stick injury (NSI): Frequency and percentage (n=4)

Table 4.30 present HCWs categories' reasons that they did not complete post exposure medication for 28 days after needle stick injury (NSI). The health care workers (HCWs) categories who indicated that they did not take post exposure prophylaxis (PEP) for 28 days were six HCWs, whereby one (1) doctor and one (1) professional nurse did not indicate the reasons for not completing post exposure medication for 28 days after needle stick injury (NSI). Two doctors (66.67%) reported that they did not take post exposure prophylaxis (PEP) because the patient was HIV negative, while one professional nurse (50%) indicated that s/he did not take medication for 28 days because of severe side effects of PEP. One general assistant (100%) did not take medication because s/he was already HIV positive.

Table 4.30 Reasons given by health care workers (HCWs) categories reasons for not completing the post-exposure medication for 28 days after sustaining a needle stick injury (NSI): Frequency and percentage (n=4)

Reasons for not completing post exposure medication for 28 days	Doctors (n=2)		Professional nurses (n=1)		Staff nurses (n=0)		Auxiliary nurses (n=0)		General assistants (n=1)	
	f	%	f	%	f	%	f	%	f	%
Starter pack x 3days	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Patient was HIV negative	2	66.67	0	0.0	0	0.0	0	0.0	0	0.0
Consent for testing was not given or risk low	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
No reason	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Severe side effects	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0
Still on treatment	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Got gastro	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
I am HIV positive	0	0. 0	0	0.0	0	0.0	0	0.0	1	100.0

1 doctor and 1 professional nurse did not respond to this question

McCracken (2008:1-64) undertook a study in the United Kingdom on the surveillance of significant occupational exposures to blood borne viruses (BBV) amongst health care workers (HCWs) who did not initiate immunodeficiency virus (HIV) post- exposure prophylaxis (PEP). A total of 889 HCWs reported having been exposed to HIV positive source patients since 2000. Reported reasons given for not initiating immunodeficiency virus (HIV) post-exposure prophylaxis (PEP) medication included: "… the exposure was perceived to be low risk by the managing clinician or exposed HCW", secondly the "… HCW refused HIV PEP" and lastly the "… interval since exposure was too great for HIV PEP to be of benefit". Of the exposed HCWs, 79% (n=700/889) initiated immunodeficiency virus (HIV) post exposure prophylaxis (PEP).Those HCWs who sustained high risk percutaneous exposures were 74% (n=517/700). Twenty percent (175/889) of HCWs did not initiate post exposure prophylaxis (PEP) despite being exposed to an HIV positive source patient, including high risk exposures. Considering the years between 2004 and 2007, there was a sustained increase in HCWs who initiated HIV PEP after percutaneous injuries (66 in 2004 to 72 in 2007) and a reduction in those who did not take PEP from 12 to 8 in 2004 and 2007, respectively.

Smith, Grohskopf, Black, Auerbach, Veronese, Struble, Cheever, Johnson, Paxton, Onorato, and Greenberg (2005:1-20) conducted a study on post-exposure prophylaxis (PEP) medication after sustaining a needle stick injury (NSI) in the United States. Health care workers (HCWs) experienced severe side effects and toxicities after taking post-exposure prophylaxis (PEP). This posed a concern. Of the 492 health care workers (HCWs) who reported to the occupational post-exposure prophylaxis (PEP) registry, 63% took at least three medications. Overall, 76% of workers who received PEP medication and went for 6 weeks of follow-up, reported symptoms such as nausea (57%) and fatigue or malaise (38%). Six (1.3%) HCWs reported severe adverse effects, and four stopped taking PEP due to side effects. Many who took PEP medication regime, did not complete the 28-day course due to side effects.

In a study done by Bandolier Extra (2003:Online) it was reported that there were 639 potential exposures of HCWs over a period of 18 months in United States. Of these 284

out of 639 occurred among nurses 44%, thirty eight doctors 22% while 148 among clinical technicians 22% and the remaining 169 exposures among housekeeping and other staff. Post-exposure prophylaxis (PEP) for HIV was taken by (13%:n=82/639) individuals, with two of thirds of HCWs who took the PEP medications for less than 96 hours. Ten HCWs completed the full four week course. Reasons for discontinuation of PEP medication, reported by HCWs were that the source patient tested negative for HIV (65%), gastrointestinal adverse effects (13%), headache (4%) and diarrhoea in 18% of HCWs. Twenty nine workers did not accept post-prophylaxis medication even when the source patients tested positive for HIV.

4.5.3.11 Health care workers (HCWs) categories whose blood were drawn and not drawn for testing after sustaining a needle stick injury (NSI): Frequency and percentage (n=99)

Table 4.31 depicts the different health care workers (HCWs) categories whose blood was drawn or not drawn for testing after sustaining a needle stick injury (NSI) (n=99). All general assistants (100%) blood was drawn after sustaining a needle stick injury (NSI), with doctors (94.29%:n=33), professional nurses (93.33%:n=28) as well as auxiliary nurses (93.33%:n=14), and staff nurses (80%:n=4). Two (5.71%:n=2) doctors, two (6.67%:n=2) professional nurses, one staff nurse (20%) and one (6.67%) auxiliary nurse also did not have their blood drawn for testing after sustaining a needle stick injury (NSI).

Table 4.31 Health care workers (HCWs) categories whose blood was drawn and not drawn for testing after sustaining a needle stick injury (NSI): Frequency and percentage (n=99)

Categories of health care workers (HCWs)	Yes (n=93)		No (n=6)	
	f	%	f	%
Doctors (n=36)	33	94.29	2	5.71
Professional nurses (n=30)	28	93.33	2	6.67
Staff nurses (n=5)	4	80.00	1	20.00
Auxiliary nurses (n=15)	14	93.33	1	6.67
General assistants (n=14)	14	100.0	0	0.0

1 doctor did not respond to this question

Lee, Botteman, Nicklasson, Cobden and Pashos (2005:741-747) investigated needle stick injury (NSI) amongst 400 nurses caring for patients in acute care setting in the District of Columbia excluding for Wyoming, North Dakota and Delaware. A total of 110 nurses, who sustained a needle stick injury (NSI) in the previous 12 months, underwent the laboratory tests more than once. Overall, at least 52 HIV seroconversion tests, 38 Hepatitis B virus (HBV) serology tests, 44 hepatitis C virus (HCV) serology tests, 15 complete blood counts (CBCs) and differentials, 18 chemistry panels, and 1 initial serum beta-HCG test were performed on the 110 nurses.

Singru and Banerjee (2008:26-30) conducted a study on occupational exposure to blood and body fluids among health care workers (HCWs) in a teaching hospital in Mumbai, India. The study population was 1550 HCWs included the following categories: Resident doctors (n= 450), interns (n=300), staff nurses (n=755) and medical technicians (n=45). Out of the1550 HCWs, population of the total sampling was 830 including: 250 resident doctors, 200 interns, 350 staff nurses and 30 medical technicians. 36.48% were health care workers (HCWs) who had undergone laboratory blood test investigations (89) after occurrence of occupational exposure to blood and body fluids. Health care workers (HCWs) who went for laboratory blood tests were resident 52% doctors (26), 57.63% interns (34), 21.09% staff nurses (27) and 28.57% medical technicians (2). 48% resident doctors (24), 42.37% interns (25), 78.91% staff nurses (101) and 71.43% medical technicians (5) did not undergo any laboratory blood investigation.

4.5.3.12 Reasons given by different health care workers (HCWs) categories for not having their blood taken for testing after sustaining a needle stick injury (NSI): Percentage (n=6)

The reasons given by different *h*ealth care workers (HCWs) categories for not having their blood taken for testing after sustaining a needle stick injury (NSI) are indicated in Figure 4.27. Only 6 of the 100 HCWs (06%:n=6) did not have blood taken for testing after needle stick injury (NSI). The reasons given included: One professional nurse

who said: "… I did not want to be tested" and one who said "…I was not prepared due to anxiety and anger", (50%). One staff nurse (100%) also indicated that "… s/he did not want to be tested", one doctor (50%) reported that "… did not take blood because it was not indicated yet" and another doctor said: "… it was not yet 3 months". Furthermore, one auxiliary nurse (100%) said "… I refused because I wasn't counseled".

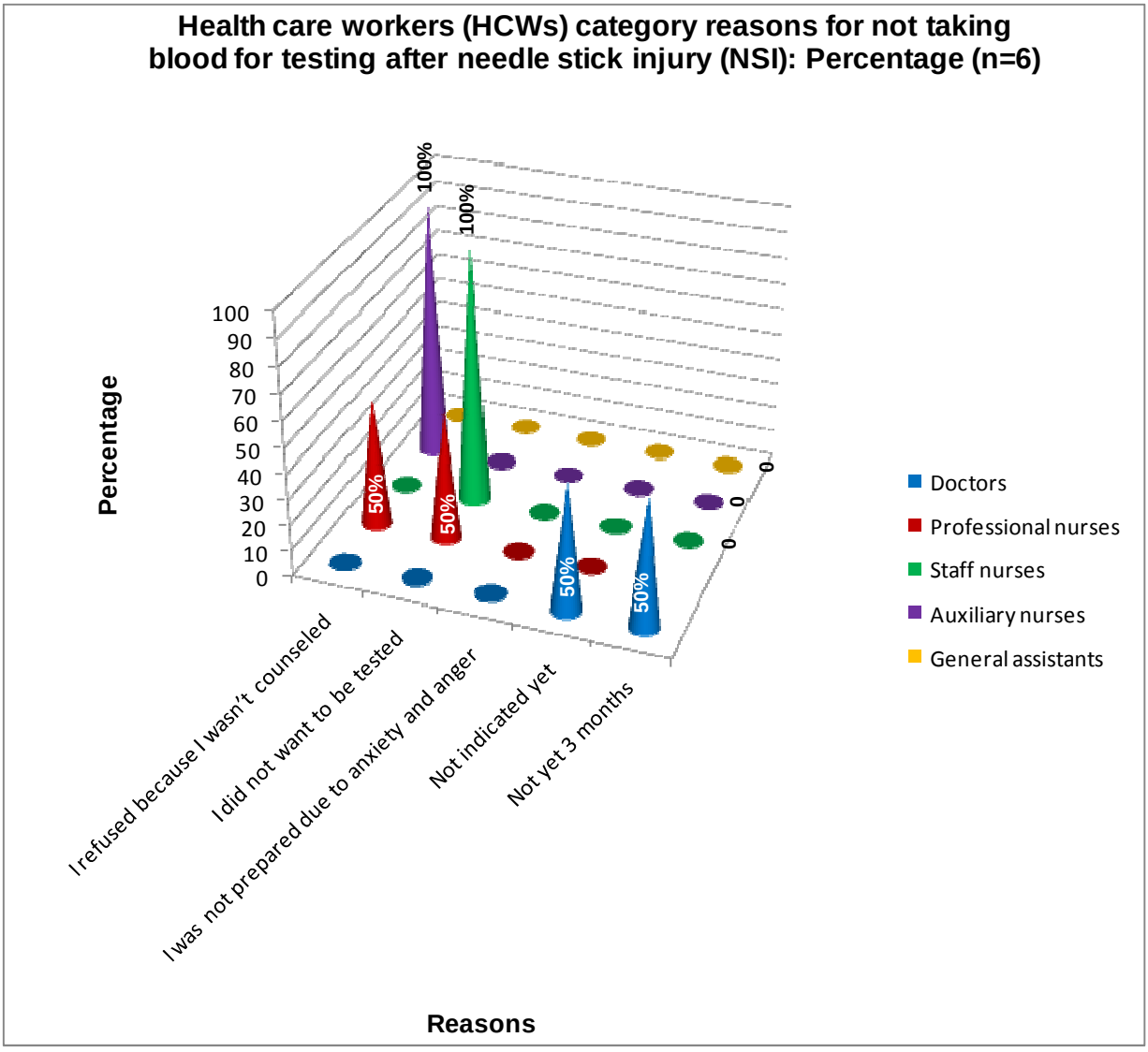


Figure 4.27: Reasons given by different health care workers (HCWs) categories for not having their blood taken for testing after sustaining a needle stick injury (NSI): Percentage (n=6)

Singru and Banerjee (2008:26-30) conducted a study in a teaching hospital in Mumbai India to assess the occupational exposure to blood and body fluids. The population consisted of 1550 health care workers (HCWs) that included the categories: 450 resident doctors, 300 interns, 755 staff nurses and 45 medical technicians. The sample of 830 HCWs included 250 resident doctors, 200 interns, 350staff nurses and 30 medical technicians. 89 respondents went for follow-up post-exposure to blood and body fluids laboratory tests, individual residents 26 (52%), 34 interns (57.63%), 27 staff nurses (21.09%) and 2 technicians (28.57), while 155 did not undergo any laboratory investigations after exposure to blood and body fluids, had taken place which included 24 residents (48%), 25 interns (42.37%), 101 staff nurses (78.91%) and 5 technicians (71.43). The reasons given were: “source thought to be non-infectious, insignificant exposure, too little time to report”.

4.5.3.13 Categories of health care workers (HCWs) who received did and not received Hepatitis B immunization post-exposure after sustaining a needle stick injury (NSI) (n=99)

The different categories of health care workers (HCWs) who did received and not received Hepatitis B immunization after sustaining a needle stick injury (NSI) are presented in Table 4.32. Of the 99 HCWs who were exposed, staff- (60%:n=3), auxiliary- (46.67%:n=7), 13 professional nurses (43.33%) and 14 doctors (40%) reported that they received Hepatitis B immunization post exposure to needle stick injury (NSI). On the other hand, 9 general assistants (64.29%) indicated that they did not receive Hepatitis B immunization after sustaining needle stick injury (NSI), as well as 21 by doctors (60%), then 17 professional nurses (56.67%), 8 auxiliary nurses (53.33%:n=) and 2 staff nurses (40%).

Table 4.32 Categories of health care workers (HCWs) who received and did not received Hepatitis B immunization post exposure to needle stick injuries (NSIs): Frequency and percentage (n=99)

Categories health care workers (HCWs)	Yes (n=42)		No (n=57)	
	f	%	f	%
Doctors (35)	14	40.00	21	60.00
Professional Nurses (30)	13	43.33	17	56.67
Staff Nurses (5)	3	60.00	2	40.00
Auxiliary Nurses (15)	7	46.67	8	53.33
General assistants (14)	5	35.71	9	64.29

One doctor did not respond to this question

Syed F. Shah a, Abdulbari Bener b,*, Saad Al-Kaabi c, Abdul Latif Al Khal c, Soji Samson b

Syed, Shah, Abdulbari Bener, Saad Al-Kaabi, Abdul Latif Al Khal & Soji Samson (2006:387–394) reported the epidemiology of needle stick injuries amongst health care workers (HCWs) working in Hamad Medical Corporation, Doha. The total respondents surveyed was 1022 HCWs that included, 163 physicians, 686 nurses, 155 laboratory technicians and 18 other HCWs from different departments of the hospitals. These HCWs are normally directly exposed to blood products and needle stick injuries while dealing with patients. The study results are as indicated in the literature as Table 2 below:

Table 1: Previous history of Hepatitis B virus (HBV) immunization and past history of subjects exposed to needle-stick injury (NSI) (n=1022)

DESCRIPTION Needle stick injuries and Hepatitis B virus (HBV) immunization	Yes n=214		No n= 808		Total n=1022	
	f	%	f	%	f	%
Received vaccination against HBV	195	91.1	716	88.6	911	89.1
Status of HBV vaccination						
Completed regular doses	156	72.9	557	68.9	713	69.8
Completed discontinued doses	10	4.7	38	4.7	48	4.7
Completed only one dose	15	7.0	41	5.1	56	5.5
Completed two doses	14	6.5	80	9.9	94	9.2
Not taken any dose	19	8.9	92	11.4	111	10.9

Source: Safety Science nr 44 (2006:387–394)

Subratty and Moussa (2007:314-322) conducted a study on the incidence of needle stick- and sharp injuries amongst health care workers (HCWs) in Mauritius for the period October to November 2003. The study population included a total number of nurses (93) all employed in the public sector and medical laboratory technicians (92). However, all medical technicians were vaccinated against hepatitis B virus, while 41 nurses received hepatitis B vaccination and 7 were not vaccinated.

4.5.3.14 Reasons given by health care workers (HCWs) categories for not receiving Hepatitis B immunization post exposure to needle stick injury (NSI): Frequency and percentage (n=51)

The reasons given by the health care workers (HCWs) category reasons for not receiving hepatitis B immunization post exposure to needle stick injury (NSI) (n=51) are presented in Table 4.33. Reasons mentioned by professional nurses (23.53%:n=4) and doctors (9.52%:n=2) were: "… It was not offered to me". "… I was immunized ± 5 years back" was reasons given by doctors (23.81%:n=5); professional nurses (47.06%"n=8); staff nurses (50%:n=1); auxiliary nurses (37.5%:n=3) and general assistants (55.56%:n=5). Another reason indicated by doctors (4.76%:n=1), professional nurses

(5.88%"n=1), auxiliary nurses (25%:n=2) and general assistants (22.22%:n=2) was "… I was not aware". Two doctors, professional nurses and two auxiliary nurses did not give a respond to this question.

Table 4.33 Reasons given by health care workers (HCWs) categories for not receiving Hepatitis B immunization post exposure to needle stick injuries (NSIs): Frequency and percentage (n=51)

Reasons for not receiving hepatitis B immunization post exposure to needle stick injury (NSI)	Doctors (n =19)		Professional Nurses (n=15)		Staff Nurses (n=2)		Auxiliary Nurses (n=6)		General assistants (n=9)	
	f	%	f	%	f	%	f	%	f	%
It was not offered to me	2	9.52	4	23.53	0	0.0	0	0.0	0	0.0
I was not aware	0	0.0	1	5.88	0	0.0	1	12.5	2	22.22
I didn't request it	0	0.0	0	0.0	0	0.0	0	0.0	1	11.11
By not knowing that I must receive it	1	4.76	0	0.0	0	0.0	1	12.5	0	0.0
I am afraid of infections	2	9.52	0	0.0	0	0.0	0	0.0	1	11.11
I was immunized ± 5 years back	5	23.81	8	47.06	1	50.0	3	37.5	5	55.56
I did not know	2	9.52	0	0.0	0	0.0	1	12.5	0	0.0
Had immunization few weeks back	4	19.05	0	0.0	0	0.0	0	0.0	0	0.0
Source titer high	1	4.76	1	5.88	0	0.0	0	0.0	0	0.0
I didn't take prophylaxis	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
I did finish counseling	0	0.0	1	5.88	0	0.0	0	0.0	0	0.0
Course not yet completed	1	4.76	0	0.0	0	0.0	0	0.0	0	0.0
Not needed	1	4.76	0	0.0	0	0.0	0	0.0	0	0.0

2 doctors, 2 professional nurses, 2 auxiliary nurses did not respond to this question

Dannetun, Tegnell, Torner and Giesecke (2006:201-204) assessed how well the guidelines on vaccination against Hepatitis B had been implemented amongst 369

health care workers (HCWs) at risk of blood exposure. The prevalence survey was conducted in six departments of a university hospital in Sweden namely: the emergency room, intensive care unit, post operative unit, surgical theatre, department of anaesthesiology and the laboratory for blood chemistry. All health care workers (HCWs) during the 24 hour of the survey completed a questionnaire. The total response rate was 369, of which 293 (79%) HCWs had received at least one dose of Hepatitis B vaccine, 147 (40%) reported that they were fully vaccinated and 76 (21%) had not been vaccinated at all. The majority 72, of unvaccinated HCWs (95%) gave reasons such as "they would accept vaccination if offered". The main obstacle reported was that compliance with the guidelines on hepatitis B immunization is not lack of acceptance amongst the employees but the failure of the employer to ensure that the policies are implemented.

Gershon *et al*. (2007:24–30) determined the prevalence and risk factors for blood borne exposure and infection amongst a total of 310 health care workers (HCWs) in Correctional settings. The study sample included 216 clinical workers (nurses, physicians and technicians) and 94 nonclinical workers such as clerks, pharmacy technicians, record keepers and administrators. Vaccination coverage differed amongst state correctional settings, with a significantly higher reported rate among respondents from Rhode Island (85%:n=63) than amongst those from Maryland (74%:n=104) or Texas (58%:n=55). A completion of primary Hepatitis B vaccination series was reported by 222 HCWs (72%), including 111 out of 166 clinical workers (67%) and 39 out of 56 nonclinical workers (70%). A negative anti-HBs result 32% was significantly associated with a longer time of the last dose of Hepatitis B vaccination, which was reported to have been received at least five or more years ago. Whereas (18%) of those who tested anti-HBs result negative, reported receiving their last dose of Hepatitis B vaccination less than 5 years ago. In addition to the HCWs who reported to have been given the Hepatitis B vaccination, 31 (10%) reported having received 1 or 2 doses of vaccine, 40 (13%) reported that they declined vaccination for a variety of reasons, (not mentioned in the results) and 17 (5%) could not remember their vaccination history.

4.5.3.15 The different health care workers (HCWs) categories who went for follow up and those who did not go for follow up after sustaining a needle stick injury (NSI): Frequency and percentage (n=99)

Information on the 99 different health care workers (HCWs) categories who went for follow up (72%:n=71) and those who did not go for follow up (28.28%n=28) after sustaining a needle stick injury (NSI) are presented in Table 4.34. Twenty three doctors (65.71%) and twenty three professional nurses (76.67%) went for follow up after sustaining a needle stick injury (NSI), followed by thirteen auxiliary nurses (86.67%), then nine general assistants (64.29%) and lastly three staff nurses (60%). Those HCWs who reported that they did not go for follow up post needle stick injury (NSI) were twelve doctors (34.29%), seven professional nurses (23.33%), five general assistants (35.71%), two staff- (40%) and auxiliary nurses (13.33%).

Table 4.34 The different health care workers (HCWs) categories who went for follow up and those who did not go for follow up after sustaining a needle stick injuries (NSIs): Frequency and percentage (n=99)

Categories health care workers (HCWs)	Yes n=71		No n=28	
	f	%	f	%
Doctors (n=35)	23	65.71	12	34.29
Professional Nurses (n=30)	23	76.67	7	23.33
Staff Nurses (n=5)	3	60.00	2	40.00
Auxiliary Nurses (n=15)	13	86.67	2	13.33
General assistants (n=14)	9	64.29	5	35.71

One doctor did not respond to this question

Jayanth *et al*. (2009:44-47) undertook a study on NSIs in a 2234 bed tertiary care hospital during a period from July 2006-June 2007. Health care workers (HCWs) who sustained NSIs were 296, including 84 nurses (28.4%), 27 student/intern nurses (9.1%), 45 cleaning staff (15%), 64 doctors (21.6%), 47 interns (15.9%), 24 technicians (8.1%) and 5 other HCW categories of staff (1.7%). The results showed that at least two thirds

202 of the NSIs were reported within one (1) hour (68.2%). All health care workers who sustained NSI were followed up at one (1), three (3) and six (6) months. Follow up involves blood testing for HIV which was completed in 293 HCWs (98.9%) with zero seroconversion at six (6) month follow up.

4.5.3.16 Reasons given by health care workers (HCWs) categories for not going for follow up after sustaining a needle stick injuries (NSIs): Frequency and percentage (n=25)

The reasons given by 25 health care workers (HCWs) categories for not going for follow up after sustaining a needle stick injury (NSI) are presented in Table 4.35. One doctor, one professional nurse and an auxiliary nurse did not give answers for this question. A doctor (8.33%), one auxiliary nurse (50%), and a general assistant (20%) as well as one professional nurse (14.29%) indicated reasons such as "… Thought there was no need as patient was HIV negative" and "… Not necessary". One doctors (8.33%:n=1), three professional nurses (42.86%) and one staff nurse (50%) indicated that "… It was not yet 3 months that a NSI was sustained" while two doctors (16.67%:n=2) and one staff nurses (50%:n=1) reported that "…Not yet due for follow up". Other reasons mentioned by doctors were the time factor, namely, "… It takes too long time/lot of administration" (8.33%:n=1), "… Have been busy" (16.67%:n=2), and "… Slipped my mind" (8.33%:n=1). One staff nurse mentioned that s/he didn't follow the procedure. Furthermore, a professional nurse (14.29%) indicated "… I was anxious / nervous" while one general assistant indicated that s/he was already HIV positive as the reason for not going for follow up post needle stick injury (NSI).

Table 4.35 Reasons given by health care workers (HCWs) category for not going for follow up after sustaining a needle stick injury (NSI): Frequency and percentage (n=25)

Reasons for not going for follow up after sustaining a needle stick injury (NSI)	Doctors (n=11)		Professional nurses (n= 6)		Staff nurses (n=2)		Auxiliary nurses (n=1)		General assistants (n=5)	
	f	%	f	%	f	%	f	%	f	%
Thought there was no need, patient HIV negative	1	8.33	0	0.0	0	0.0	1	50.0	1	20.0
I was not informed	0	0.0	1	14.29	0	0.0	0	0.0	3	60.0
No reason	1	8.33	0	0.0	0	0.0	0	0.0	0	0.0
Not necessary	1	8.33	1	14.29	0	0.0	0	0.0	0	0.0
Not yet 3 months that NSI was sustained	1	8.33	3	42.86	0	0.0	0	0.0	0	0.0
Still on treatment	1	8.33	0	0.0	0	0.0	0	0.0	0	0.0
I didn't follow the procedure	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
I was anxious /nervous	0	0.0	1	14.29	0	0.0	0	0.0	0	0.0
Not yet due for follow up	2	16.67	0	0.0	1	50.0	0	0.0	0	0.0
Slipped my mind	1	8.33	0	0.0	0	0.0	0	0.0	0	0.0
Have been busy	2	16.67	0	0.0	0	0.0	0	0.0	0	0.0
Takes too long time/ lot of administration	1	8.33	0	0	0	0	0	0	0	0
I am HIV positive	0	0.0	0	0.0	0	0.0	0	0.0	1	20.0

One doctor, one professional nurse, one auxiliary nurse did not give answers for this question

The HIV Post-Exposure Prophylaxis (PEP) Guidance from the United Kingdom (UK) Chief Medical Officers' Expert Advisory Group on AIDS (2008:1-75) indicated that there are a number of practical arguments in favour of terminating follow up with serological testing with a minimum of 12 weeks after exposure incident or when post-exposure prophylaxis (PEP) medication was discontinued. The principal reasons indicated by the

UK Chief Medical Officers' Expert Advisory Group on AIDS (2008:1-75) are:

- "A negative test at 12 weeks provides a very high level of confidence of freedom from infection (due to high sensitivity of combined antibody/antigen serological assays);
- To minimize the period of anxiety suffered by the exposed HCW waiting for the 'all clear';
- To focus efforts and resources of the occupational health department on improving completeness of 12 week follow up testing;
- In the majority of cases where seroconversion has occurred following occupational exposure, despite the use of triple PEP medication, seroconversion has been detected within 12 weeks of exposure, and
- A negative test at 12 weeks post exposure provides reassurance of freedom from infection".

Kowalska *et al.* (2006:789-794) reporting on "Post-exposure prophylaxis (PEP) of HIV infection in an out-patient clinic of a hospital for infectious diseases in Warsaw in 2001-2002" found that amongst 29 exposures in health care workers (HCWs) and 98 non-health care workers only one HIV test was done in 25 HCWs (31,6%) and 16 non-HCWs (16.3%). Only 12 HCWs (15.2%) and 9 non-HCWs (9.3%) did not come for follow-up test results. The reason for not going for follow up after sustaining a NSI was because of the side effects of the PEP mediation.

4.6 CONCLUSION

In this chapter (4) an in depth discussion of the results of the analyzed data of the three Sections A, B and C of the questionnaire was done. The results were on the reported needle stick injuries (NSIs) amongst health care workers (HCWs) of the Free State Province Department of Health (DoH) public health sector regional hospitals. The study results were supported by literature. The discussion of the study results was outlined in text, tables, graphs and figures to accommodate all types of readers (Bak, 2003:38).

The study results support the issue that needle stick injuries happened during the course of HCWs daily work. There are departments, ward or units (Figure 4.2) where the uses of needle devices are unavoidable, thus posing HCWs at risk to exposure of sustaining a NSI, such as Paediatric ward (14%) compared to Orthopedic ward (3%). Most NSIs were sustained in majority by doctors (36%) and professional nurses (30%) out of 100 study population. The contributory factors such as the type of needle device that caused most injury was identified as significant, where almost half 47 of all HCWs categories (47%) sustained a needle stick injury (NSI) caused by an injection needles while suture needle accounted for 21% of the injuries.

The danger of exposure to NSI is considered by the type of needle device as well as the needle from the source patient as indicated by literature (CDC, 2007:Online). CDC indicated that the use of safe needle device can reduce the injuries by 90%. The blood status of the source patient, with regard to Hepatitis B virus, is more of risk to transmission of infection than the HIV status due to NSI, as indicated by literature. The risk of HIV transmission due to NSI is 0.3-4.4% (Prüss-Üstün, Rapiti, & Hutin 2005:482-490), while De Villiers, Nel, & Prinsloo, 2007:14 indicated that the risk of developing clinical hepatitis B infection from a needle contaminated with HBsAg-positive or, HBeAg-negative blood is 1%-6%, and the risk of developing serologic evidence of HBV infection is, 23%-37%. In this study 41 out of 100 HCWs were exposed to unknown HIV source status (41%) as well as 34 HCWs exposed to HIV positive source status (34%). The concern from this study is that there is no follow up blood tests of the source status of the patient done. The results revealed that there are HCWs (n=28) who reported that they did not go for their follow up blood test, giving different reasons as indicated in Table 4.35. The next chapter (5) will present the research findings, recommendations, limitations and conclusions.

CHAPTER FIVE: FINDINGS, RECOMMENDATIONS, LIMITATIONS AND CONCLUSIONS

5.1 INTRODUCTION

The previous chapter discussed the data analysis and results on reported needle stick injuries (NSIs) amongst health care workers (HCWs) in the Free State Province Department of Health (DoH) public health sector regional hospitals. An outline of the research findings, recommendations based on Sections A, B and C of the questionnaire (Annexure D), limitations and conclusions will be presented in this chapter.

The study results, conclusions and recommendations will be made available and presented to the Free State Department of Health (DoH), the Provincial Occupational Health Unit, as well as the field workers who are the occupational health nurse practitioners (OHNPs) in the different Free State Province Department of Health (DoH) public health sector regional hospitals (Figure 1.1). A copy of the study will also be given to the Global Health Research Program, the University of British Columbia as well as the respondents on request (as indicated in Chapter 1 1.15.3).

It should be noted that it was not the aim of the researcher to provide the conclusions according to the same sequence as in the questionnaire.

5.2 FINDINGS

5.2.1 HEALTH CARE WORKERS (HCWs) WHO ARE AT RISK OF NEEDLE STICK INJURIES (NSIs)

- All health care workers (HCWs) are in the course of their work at risk for exposure when sustaining needle stick injuries (NSIs), as indicated in Table 4.6, namely, wards, units or department of exposure prone procedures performed in such workplaces. Thus the type of work is a contributory factor to NSIs because due to the use of needles with the result that NSIs are unavoidable. These procedures are conducted for therapeutic purposes on patient/s for example,

injection administration, immunizations, performing operations, suturing open wounds as well as insertion of intravenous infusions.

Doctors opposed to other HCWs are more at risk for needle stick injuries (NSIs) when they work in wards, units or department such as, theatre (25%:n=9), casualty (19.4%:n=7) and paediatric wards (13.9%:n=5). The risks for professional nurses are especially increased when they work in maternity wards (20%:n=6) and paediatrics wards (16.7%:n=5). In the case of staff nurses (40%:n=2) and auxiliary nurses (26.7%:n=4) NSIs occurred in medical wards. General assistants are prone to NSIs while performing their duty in an intensive care unit (21.4%:n=3).

5.2.2 MONTHS WORKED BY HEALTH CARE WORKERS (HCWs) IN THE DIFFERENT WARDS, UNITS OR DEPARTMENT AND THE OCCURRENCES OF SUSTAINED NEEDLE STICK INJURY (NSI)

- Despite the length of time worked in the wards, units or department, HCWs are at risk to sustain NSIs. Doctors (37.14%:n=13) sustaining a needle stick injury within the first three months in a workplace. Professional nurses (3.85%:n=1), auxiliary nurses (33.33%:n=5), and general assistants (7.14%:n=1) sustained NSIs within a period of two to five months.
- It is of concern that the occurrence rate of needle stick injuries (NSIs) amongst HCWs for the period January 2006 to September 2007 (n=80) ranged from two to six times per individual HCW, with the highest reported occurrences amongst professional nurses and doctors. The fact that second (n=38) and third (n=30) injuries occurred amongst most HCWs categories is also noted with concern.

5.2.3 INDICATED TIME WHEN INJURY WAS SUSTAINED AND THE TYPE OF NEEDLE DEVICES THAT CAUSED NEEDLE STICK INJURIES (NSIs)

- The risk for sustained NSIs increase between 07:00 and 10:00. This peak time for occurrences of NSIs could possibly be due to most work procedures performed during morning hours, for example, doctors who reported most injuries while working in operating theatres (25%:n=9). The time of injury, between 07:00-10:00, was also common amongst general assistants (71.4%: n=10) staff nurses

(40%:n=2) professional nurses (37.9%:n=11) and auxiliary nurses (38.5%:n=5). Staff nurses were also at risk between 14:00-19:00. Less NSIs were reposted between 19:00-23:00 (8.42%:n=8) and between 23:00-06:00 (6.32%:n=6) which could possibly be as a result of less work procedures been performed during the night shift.

- The circumstances leading to needle stick injuries (NSIs) depend partly on the type and design of the needle devices and certain work procedures. Injection needles play an important role in NSIs (doctors, 22.2%:n=8; professional nurses, 50%:n=15 and staff nurses, 80%:n=4). Secondly, suturing needles (doctors 44.4%:n=16 and professional nurses,13.3%:n=4) and lastly procedures where general assistants, (50%:n=7) indicated occurrences were during cleaning up and disposal of needles.

5.2.4 FACTORS CONTRIBUTING TO NEEDLE STICK INJURIES (NSIs)

- There is no single cause of NSIs. The causes mentioned in this study which need to be addressed included, for example, manipulating the needle; disposing of the needle; cannulation, cleaning up; and wrong disposal of needle/device. The above mentioned causes, however, refer to issues already addressed by the health and safety policy namely: Free State Department of Health (DoH) Health Human Resource Management Circular No. 75 of 2008.
- It seems though that manipulating of the needle as cause of NSIs is more prominent amongst staff nurses (60%:n=3) and doctors (47.2%:n=17), with professional nurses (20%:n=6) posing the third highest risk. The possibility that non-compliance of HCWs to policy requirements should therefore be considered as a contributory factor in sustaining NSI, for example, recapping the used needle devices. Firstly, because (91.92%:n=91) of the health care workers (HCWs) reported that they were aware of the needle stick injury policy in their respective hospitals, and secondly, that HCWs indicated that they attended in-service training on the prevention (80%:n=80) and management (83%:n=83) of NSIs. Non-compliance of policy coupled with the unsafe needle devices used could aggravate the rate of sustained NSIs.

5.2.5 THE USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

- The use of personal protective equipment (PPE) was a concern especially with regard to auxiliary nurses which showed policy non-compliance. More than half of the auxiliary nurses (73.3%:n=11) out of 15 reported that they did not wear PPE during NSIs. The researcher considers this practice risky especially when this is compared to (1) the type of needle device (injection needle, 60%:n=9) that caused their NSIs, (2) the reported occurrences (two to three times) of NSI, (3) the extent of the NSIs (deep NSIs, 39.39%:n=39, from an HIV positive sources, 34%:n=34, and unknown sources, 25%:n=25). Mentioned reasons such as "thought it was not necessary to wear PPE" (54.6%:n=6) was reported by the auxiliary nurses. The use of PPE showed policy compliance by all the other study participants and is discussed in chapter four (4).

5.2.6 IMMEDIATE ACTION TAKEN BY HEALTH CARE WORKERS (HCWs) TO THE INJURED AREA

- The research results indicated an insufficient knowledge regarding immediate action/s to be taken by HCWs to manage the injured area after NSIs. HCWs (n=72/100) expressed blood from the finger post NSIs. This practice is not recommended by the guidelines on management of exposure to blood borne pathogens (BBPs) as cited by the Centers for Disease Control and prevention (CDC) (2008:Online). It is however clear that there is also a policy gap, as the information that the finger or injured area after sustaining a NSI should not be expressed to minimize infection, is not included in the Free State Department of Health (DoH) Health Human Resource Management Circular No. 75 of 2008. The positive aspect was that some HCWs took immediate action that was compliant with the current policy requirement by washing or rinsing the inflicted area under running tap water.

5.2.7 REPORTING OF NEEDLE STICK INJURIES (NSIs)

- The reporting of NSIs showed significant results as (98%:n=98) of HCWs categories reported immediately after sustaining the NSIs and this is compliant

with the policy (Free State Department of Health (DoH) Health Human Resource Management Circular No. 75 of 2008). Reporting was done to different people (as indicated in chapter four) such as, the matron in casualty; the sister or the matron in charge in their wards/units or departments; some reported to their supervisors. Almost ninety-one percent reported to the occupational health clinic/nurse (90.63%:n=90). Only a few did not report to the occupational health clinic/nurse (9.38%:n=9). Those who did not report the NSIs to the occupational health clinic/nurse stated that "... the patient was HIV negative"; "... the supervisor was already involved"; that they "... reported to a consultant". One HCW indicated that s/he did not know that s/he has to report and one general assistant thought that the sister would report on her behalf.

5.2.8 HEPATITIS B IMMUNIZATION AND HIV STATUS OF THE SOURCE PATIENT

- All 91 health care workers (HCWs) did conform to Hepatitis B virus (HBV) immunization as provided by the work settings, prior to sustaining a NSI. However, what is of concern, is that more than half (n=51) of the HCWs, reported that they were not given Hepatitis B immunization after NSIs. Those were doctors (60%:n=21), professional nurses (56.67%:n=17), general assistants, (64.29%:n=9), auxiliary nurses (53.33%:n=8) and lastly staff nurses (40%:n=2).
- Another concern was the possibility that immunity status of eleven HCWs (11%) could not be confirmed against Hepatitis B virus (HBV) immunity as they could not recall when last (the year) they had received Hepatitis B immunization.
- Some HCWs made unsafe decisions by making "... own risk assessment of the HIV status of the source patient" before deciding how to proceed after NSIs. The researcher's argument and concern on such statements, is the fact that HIV negative status of the source patient at the time of NSIs, cannot be guaranteed. The researcher could not find literature which guarantees that if the patient's HIV status is negative, the Hepatitis status then automatically is not to be considered a problem. Protection against Hepatitis B infection is a need especially because the chances of acquiring Hepatitis B as indicated by literature, are 37%-62% (De Villiers, Nel & Prinsloo, 2007:14) if you have never before been vaccinated.

Another known fact is that there is a window period before a person tests HIV positive. The patient's HIV status is not tested as it is done with HCWs. Findings from the research support the researcher's concern regarding unsafe decisions made by HCWs. It was alarming that HCWs 59%:n=59 sustained NSIs from high risk sources (patient with the human immunodeficiency virus (HIV) positive source, 34%:n=34, and unknown source status 25%:n=25).

5.2.9 BLOOD TESTING AFTER NEEDLE STICK INJURIES (NSIs)

- It can be indicated that HCWs are cautious about the fact that they sustained NSIs from a positive source patient as well as an unknown source. This could be supported by the results of this study, that HCWs who went for blood testing was higher (n=93) than those who did not go for blood testing (n=6). The researcher expected lower positive responses, looking at those HCWs who reported that they were not given Hepatitis B immunization after NSI (n=51), as blood testing after NSI is done to verify the HCWs Hepatitis B and HIV status during NSIs.

  However, what is of concern is that there are those HCWs who did not go for blood testing after the NSIs, which should be regarded as having been a risky decision. It will be difficult to verify or classify blood results as acquired from work, should there be a problem reported or identified after the incident.

  Some given reasons for not going for blood testing were: "... I did not want to be tested"; "... I was not prepared due to anxiety and anger"; "... I did not take blood because it was not indicated yet" and "... it was not yet 3 months". One auxiliary nurse said that she "... refused because she was not counselled'.

5.2.10 POST EXPOSURE PROPHYLAXIS (PEP) FOR HUMAN IMMUNODEFICIENCY VIRUS (HIV)

- It was a good indication that a large number of HCWs (85%:n=85) reported that they received post-exposure prophylaxis (PEP) against HIV within two hours after sustaining a NSI. A very small number (8%:n=8) received the PEP late before going off duty, while others (6.06%:n=6) received it the following day,

which was more than two hours after sustaining a NSI. However, these HCWs could still be counted as positive results, although the timeframe to get PEP was not according to policy, except for those HCWs who indicated that they did not receive the post-exposure prophylaxis (PEP) after sustaining a needle stick injury (NSI). Three were doctors (8.03%:n=3), two professional nurses (6.67%:n=2) and one general assistant (7.14%:n=1) did not receive the post-exposure prophylaxis (PEP), after sustaining a needle stick injury (NSI). There could be a chances of HIV seroconversion if NSI is sustained and PEP is not given (CDC, 2007:Online). It was noted that statistically the HCWs who reported that they did not take PEP after NSIs, are not considered significant (6%:n=6), but this is non-compliance to the post-exposure guidelines of CDC (2007:Online).

- Post-exposure prophylaxis (PEP) stat dose should be given after sustaining a NSI to all, for protection against HIV infection. The dose should preferably be taken within the first 2 hours and not later than 8 hours post exposure. It could probably still be indicated 3 days or even later after exposure (Steyn, 2005:3). Taking PEP does not necessarily indicate a 100% safeguard of the individual from seroconversion.

5.2.11 FOLLOW UP AFTER SUSTAINING A NEEDLE STICK INJURIES (NSI)

- Although 72% HCWs (n=71) reported that they went for follow up at an occupational health clinic, twenty eight (28.28%:n=28) did not go for follow up after sustaining a NSIs. Time factor was one of the reasons mentioned by doctors. They stated that it "... takes too long time/lot of administration"; that they "... have been busy"; as well as "... slipped my mind". A staff nurse mentioned that s/he "... didn't follow the procedure". A professional nurse indicated that s/he "... was anxious/nervous"; and lastly a general assistant mentioned that s/he "... was already HIV positive". Despite the reasons, the aim should be to reduce the number of HCWs that are non-compliant with the policy for management of needle stick injury, the Free State Department of Health (DoH) Health Human Resource Management Circular No. 75 of 2008 (Oosthuizen, 2008: 1-28). Policy states that follow up after sustaining a needle stick injury (NSI) should be done at

six weeks, three months and six months (Oosthuizen, 2008:1-28).

5.3 RECOMMENDATIONS

The recommendations for the entire study, based on the study findings, should be focused on the following: policy development and review; development of exposure prevention programs; infection control curriculum review, in-service training; health and safety issues; needle stick injury (NSI) cost to company; monitoring and evaluation.

5.3.1 POLICY DEVELOPMENT AND REVIEW

- The Directorate for communicable diseases, Occupational Health and Infection Control units should establish protocols for HCWs infected with communicable diseases to protect both HCWs and patients to reduce the risk of staff-to-patient transmission; for example, exclusion from exposure prone procedures (Robb, 2005: Online). Such a policy is non existent in the Free State Department of Health (DoH). The present policy provides solutions for the management of needle stick injuries (NSIs) but a national approach is not included. The information for reduction of the risk of staff-to-patient transmission could be included in the Free State Department of Health policy, Health Human Resource Management Circular No. 75 of 2008 (Oosthuizen, 2008:1-28). Such information will set guidelines for blood borne viruses' clearance for those who will be performing exposure prone procedures.
- There is an urgent need for recognition and implementation of the South Africa 2002 Healthcare Worker's HIV/AIDS Ethical guidelines in all public sector hospitals, as it gives specific guidelines to protect the patients and indicates the legal duties of health care workers infected with HIV (Robb, 2005: Online). The guidelines further indicate that, during exposure prone procedures, the HCW could result in worker's blood contaminating the patient's open tissues, this is described as "bleed-back" therefore, HIV infected health care workers (HCWs) must not perform any exposure prone procedures (Robb, 2005: Online).

- Continuous review and evaluation of applicable policies should be done in prevention of NSIs, such as Infection control and Waste Management policies; with involvement of relevant stakeholders such as Occupational Health Nurse Practitioners, Health and Safety Representatives and Infection Control Professional.

5.3.2 DEVELOPMENT OF EXPOSURE PREVENTION PROGRAMS

- To reduce the risk of sustaining NSIs there is a need to develop comprehensive exposure prevention programs that addresses measures to prevent and reduce the likelihood of transmission of blood borne pathogens (BBPs) and increase the knowledge about infection control. This program will include guidelines and training such as measures that will assist HCWs to contribute to their own safety and safety of the other HCWs and clients or patients, for example, to regard all patients and patient products as possibly infectious.

5.3.3 CURRICULUM REVIEW

- The study will also recommend that the curriculum on infection control should be revisited by clinical departments as well as tertiary institutions at an entry level, bearing in mind that there are those HCWs who sustained NSIs after less than a month in the workplace.

5.3.4 IN-SERVICE TRAINING

- Training should be initiated per category of HCWs, wards, units or department specific to ensure that HCWs exposure to NSIs is reduced. Such training should be conducted and monitored for example, by the Occupational Health Nurse Practitioners, Infection Control Professionals and the staff of the Quality Assurance unit. Occupational health Nurse Practitioners (OHNPs) should be responsible to give continuous health promotion workshops/seminars on the importance of Hepatitis B vaccination, health care workers' (HCW) legal responsibility, as well as on reduction of exposure to blood borne infections;

- Training on safe medical waste disposal and the correct collection of biohazard waste containers should especially focus on the general assistants, because the research findings indicated that they are the most at risk;
- Newly appointed HCWs need immediate induction training to be provided on prevention of NSIs as well as continuous training for those HCWs who have worked for a long time in wards, units or department;
- Health care workers' (HCWs) training and education should be continuous and preventive measures such as the correct method to discard used needles should be focused on, targeting also categories of HCWs who had more than one occurrences of NSI;
- In-service training should be continuous as to bring about behaviour change and creating safer environment between HCWs, management and patients where the incidence and feedback around NSIs can be comprehensively addressed.

5.3.5 HEALTH AND SAFETY ISSUES

- The use of safe needle syringes such as retractable needles should at least be compulsory in theatres, casualties, intensive care units, and paediatric wards where exposure prone procedures or the use of needles are unavoidable;
- Medical biohazard sharps containers should be accessible, located in areas where the needle use is frequent to avoid causing an injury to other HCWs when disposing of a used needle;
- Where possible, oral medication should be prescribed to avoid unnecessary use of needle devices;
- Proper management and follow up of HCWs after needle stick injuries (NSIs) should be implemented and also for those known HCWs infected with blood borne pathogen/s while there is no exiting policy/protocol;
- All health care workers (HCWs) should get three doses of Hepatitis B vaccine free of charge;
- The Hepatitis B immunity status of HCWs should be established prior exposure to any risk of blood borne infections (BBPs). Blood screening after the third dose of Hepatitis B vaccine should be done to check anti-HB antibodies or immune

status, to ascertain the need for re-immunization as indicated in the Free State Department of Health policy, Health Human Resource Management Circular No. 75 of 2008 (Oosthuizen, 2008:1-28).;

- The wearing of PPE, such as gloves and eye protection when there is a risk of coming into contact with blood or body fluids of any patient, is highly recommended;
- Occupational health nurse practitioner should have counselling sessions with those HCWs who are on treatment of PEP for encouraging them to complete treatment and monitor side effects;
- Health care workers (HCWs) should take own responsibility for the health and safety as well as those of other HCWs by being more cautious when handling needle devices. Health and safety representatives should identify and keep record of all reported NSIs and ensure policy implementation as well as inspections of unsafe practices that contribute to NSIs as part of their functions (Occupational Health and Safety Act, No. 85 of 1993, Section 18 (b), (c) and (d);
- The ward, unit or departmental supervisor as well as health and safety representatives of that area should enforce a strong safety climate that is supportive of safe work practices and risk reduction approaches that targets specific HCW as part of their delegated function as safety representatives and;
- Health care worker (HCWs) should be educated on the importance of reporting NSIs and the benefit of PEP to be understood by all to reduce the exposure to BBPs and the cost of management of NSIs

5.3.6 COST TO COMPANY

- The cost implications of needle stick injuries (NSIs) for example should be measured for a total study population (n=100) to the cost of the use of safety needle devices and safe gloves. The cost should be investigated, to establish cost that could have been saved, especially in workplaces where suturing is done and injections administered.

5.3.7 MONITORING AND EVALUATION

- Infection control professional and occupational health nurse practitioners should ensure that HCWs are knowledgeable of relevant policies. They should be responsible for the enforcement of policies that address needle stick injuries (NSIs) as well as for the development of such policies where they are non-existent;
- The exposure reporting format should be made simple in order to encourage reporting of NSIs by HCWs who are hard pressed for time, as indicated by the study results.

In addition to the above mentioned recommendations, arising from the study, the researcher supports the recommendation for legal responsibility assigned to Hospital Managers, by the Head of the Department of Health (HoD) to comply with the Occupational Health and Safety Act, No. 85 of 1993, (Section 16.1 & 2). In this Act, (Section 8) indicates that (1) "... every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees" This assigned legal responsibility cannot be compromised as there is legal action for contravention of the Act, according to Occupational Health and Safety Act, No. 85 of 1993, (Section 38). This legal compliance should be discharged by management as stipulated.

5.4 RECOMMENDATIONS ON POSSIBLE RESEARCH TOPICS

The recommended possible research that would support this study results includes:
(1) The knowledge, attitude and practices among health care workers on needle stick injuries; (2) Evaluation of strategies to reduce poor policy implementations or compliance; (3) Protecting HCWs against blood borne pathogens (BBP), and (4) The financial impact of needle stick injuries (NSIs) on the Department of Health.

5.5 LIMITATIONS

In this study, it can be conclude that this is not a total reflection of all reported NSIs in the Free State Province Department of Health (DoH) public health sector regional

hospitals. Firstly, there is a possibility of under reporting of NSIs amongst HCWs categories, as those included for the study are only those who reported and documented in the injury on duty (IOD) register at occupational health clinics in different hospitals. Secondly some HCWs categories, for example, allied health care workers; phlebotomists; part time/contract workers; students who are in contact with patients' body and blood fluids were not included. Thirdly there was exclusion of other institutions that report all incidences of NSIs directly to the Free State Province Department of Health (DoH), for example, District hospitals and Central laundries. It would be recommended again to conduct similar study in all Free State Province Department of Health (DoH) hospitals and institutions to assess the extent of NSIs amongst HCWs and evaluate the existing training programmes for developing capacity of all levels of health care and refine strategies for ensuring healthy self reliant HCWs as well as patient safety.

5.6 CONCLUSION

The aim of this study was to investigate the reported needle stick injuries amongst health care workers in the Free State Province Department of Health (DoH) public health sector regional hospitals. In this study needle stick injuries (NSIs) were defined as any injury caused by different types of needle devices, irrespective of the purpose of use.

The prevalence of NSIs amongst HCWs, as revealed in this study could be the tip of the iceberg in relation to the actual sustained NSIs as not all HCWs had reported the sustained NSIs. This portrays a skewed image of what the real situation is of actual sustained reported NSIs in the Free State Province Department of Health (DoH) public health sector regional hospitals. It is of utmost importance that HCWs realise the importance of reporting all sustained NSIs to the occupational health nurse practitioners or the nominated persons as indicated in the needle stick injury policy by the Free State Department of Health.

There is thus a need for addressing NSIs policy implementation and to review the updated strategies regarding the exposure prevention. Continuous in-service training of HCWs and evaluation of training should be done to reduce the exposure to NSIs. There is also a need of Management support to ensure policy compliance and team approach in prevention and reduction of needle stick injuries (NSIs) within the Free State Province Department of Health (DoH) public health sector.

SUMMARY

The aim of this study was to investigate reported needle stick injuries amongst health care workers in regional hospitals in the Free State Province during the time period January 2006-September 2007. Needle stick injuries were defined as any injury caused by different types of needle devices, irrespective of the purpose of use.

A quantitative, non-experimental, descriptive and retrospective design was used. Data was collected through an interview using a questionnaire. The total population interviewed was 100 health care workers, namely doctors; professional nurses; staff nurses; auxiliary nurses and general assistants. Descriptive statistics, namely frequencies and percentages for categorical data, medians and percentiles for continuous data were calculated and compared by means of 95% confidence intervals for all categories of health care workers.

The results of the study indicated that health care workers are at risk of sustaining needle stick injuries in the course of their work. The reported causes of the needle stick injuries were issues related to policy non-compliance, coupled with the use of unsafe needle devices. Ninety-nine health care workers (91.92%) were aware of the needle stick injury policy, eighty health care workers had in-service training (80%) on the prevention and eighty-three health care workers had in-service training on the management of needle stick injuries (83%). Fifty general assistants (50%) reported needle stick injuries due to wrong disposal of used needles. Injection needles (47%) accounted for the majority of needle stick injuries. A total of eighty health care workers (80%) reported two to six times occurrences of needle stick injuries. The peak time of needle stick injuries reported was between 07:00-10:00 for all health care workers, except for doctors. Less needle stick injuries were reported between 19:00-23:00 (8.42%:n=8/95) and between 23:00-06:00 (6.32%:n=6/95). Health care workers (85%:n=85) received post exposure prophylaxis (PEP) within two hours post needle stick injuries.

The findings indicated that there is a need to address the needle stick injury “policy implementation” and “review” to include updated exposure prevention strategies. Continuous training of health care workers and evaluation of such interventions should be done to reduce the exposure to needle stick injuries. Policy compliance needs Management support and a team approach.

OPSOMMING

Die doel van die studie was om aangemelde naaldprikbeserings onder gesondheidsorgwerkers vir die Vrystaatse Openbare Gesondheidsektor streekshospitale te ondersoek wat gedurende die periode Januarie 2006-September 2007 voorgekom het. In hierde studie is naaldprikbeserings gedefinieër as enige besering wat deur verkillende tipes naaldtoestelle, ongeag die doel of die gebruik daarvan versoorsaak is.

'n Kwantitatiewe, nie-eksperimentele, beskrywende en retrospektiewe ontwerp is gebruik. Data is deur middel van 'n onderhoud met behulp van 'n vraelys versamel. Die totale populasie met wie onderhoude gevoer is, was 100 gesondheidsorgwerkers, te wete, dokters, professionele verpleegkundiges, ingeskrewe verpleegkundiges, verpleeghulpe en algemene assistente (skoonmakers). Beskrywende statistiek, naamlik, frekwensies en persentasies vir kategoriese data en mediane en persentiele vir aaneenlopende data is bereken en vergelyk ten opsigte van al die kategorieë van gesondheidsorgwerkers deur middel van 'n 95% betroubaarheidsinterval.

Die bevindinge van die studie het daarop gedui dat gesondheidsorgwerkers 'n risiko loop in die verloop van hulle werk om naaldprikbeserings op te doen. Die oorsake wat aangedui is, het verband gehou het met verontagsaming van beleide, tesame met die gebruik van onveilige naaldtoestelle. Een en negentig gesondheidsorgwerkers (91.92%) was bewus van die naaldprikbeseringsbeleid, tagtig het indiensopleiding rakende die voorkoming (80%) en drie en tagtig het indiensopleiding rakende die hantering van naaldprikbeserings (83%) gehad. Vyftig algemene assistente (50%) het naaldprikbeserings opgedoen as gevolg van die verkeerde metode gebruik is om van gebruikte naalde ontslae te raak. Die meeste van die naaldprikbeserings (47%) is deur inspuitingsnaalde (spuitnaalde) veroorsaak. 'n Totaal van tagtig gesondheidsorgwerkers (80%) het twee tot ses naaldprikbeserings aangemeld. Die spitstyd van gerapporteerde naaldprikbeserings was tussen 07:00-10:00 vir alle gesondheidsorgwerkers, behalwe vir dokters. Minder naaldprikbeserings was gedurende 19:00-23:00 (8.42%:n=8/95) en

tussen 23:00-06:00 (6.32%:n=6/95) aangemeld. Gesondheidsorgwerkers (85%:n=85) het na-blootstelling profilakse binne twee ure na die naaldprikbeserings ontvang.

Die bevindinge het aangedui dat daar ‘n behoefte is om die naaldprikbeseringsbeleid met betrekking tot “implementering” en “hersiening” van opgedateerde blootstellingsvoorkomingspraktyke aan te spreek. Volgehoue opleiding en evaluasie van gesondheidsorgwerkers moet gedoen word om blootstelling aan naaldprikbeserings te beperk. Die ondersteuning van die bestuur asook ‘n spanbenadering is nodig om te verseker dat die beleid nagevolg word.

BIBLIOGRAPHY

Adebamowo, C., Ezeome, E. R., Ajuwon, A. J. & Ogundiran T. O. 2002. Survey of the knowledge, attitude and practice of Nigerian surgery trainees to HIV-infected persons and AIDS patients. **Bio Medical Central Surgery,** 2 (7): pp.1471-2482, August. [online]. Available from: <http://www.pubmedcentral.nih.gov/articerender.fcgi?artid=126215> [Accessed 18 March, 2008].

Aiken, L., Clarke, S. & Sloane, D. 2002. Hospital staffing, organization and quality of care: Cross-national findings. ***Nursing outlook*****,** 50(5): *pp.* 187-194.

Alam, M. 2002. Knowledge, attitude and practices among health care workers on needle-stick injuries. **Annals of Saudi Medicine***,* 22(5-6): *pp.* 396-399. (no month).

Alamgir, H., Cvitkovich, Y., Astrakianakis, G., Yu, S. & Yassi, A. 2008. Needle stick and other potential blood and body fluid exposures among health care workers in British Columbia, Canada. **American Journal of Infection Control,** 36(1): *pp.* 12-21, February.

Alcorn, K. 2004. South Africa faces health care worker crisis [online]. Available from: <http://www.aidsmap.com> [Accessed 11 March, 2008].

American Nurses Association. 2002. **ANA's needle stick prevention guide,** [online]. Available from: <http://www.nursingworld.org/FunctionalMenuCategories/MediaResources/MediaBackgrounders/NeedlestickPrevention.aspx> [Accessed 18 December, .2007].

American Nurses Association. 2007. Medication errors and syringe safety are top concerns for nurses according to new national study**. News Release,** 37(4): *pp.* 4-5, July.

Anon, 2003. Needlestick injuries. **Bandolier Journal** [online]. Available from: <http://www.medicine.ox.ac.uk/bandolier/Extraforbando/needle.pdf> [Accessed 7 October, 2006].

Araf, S. 2006. [online]. Available from: <http://www.ucl.ac.uk/cihd/undergraduate/elective_info/elective report/2006_araf> [Accessed 02 May 2009].

Askarian, M., Shaghaghian, S. & McLaws, M.L. 2007. Needle stick injuries among nurses of Fars province Iran. Annals of Epidemiology, 17(12): *pp.* 988-992, October. Available from: <http://www.uwc.ac.za/usrfiles/users/4196080617/Microsoft_Word_ACADEMICWRITINGGUIDEcompletedraft.pdf> [Accessed July, 2009].

Ayas, N.T., Barger, L.K., Cade, B.E., Hashimoto, M., Rosner, M.D., Cronin, J.W., Speizer, F.E. & Czeisler, C.A. 2006. Extended work duration and the risk of self-reported percutaneous injuries in interns. **Journal of the American Medical Association,** 296(9): *pp.* 1055-1062, September.

Azar-Cavanagh, M., Burdt, P. & Green-McKenzie, J., 2007. Effect of the introduction of an engineered sharps injury prevention device on the percutaneous injury rate in healthcare workers. **Infection Control & Hospital Epidemiology,** 28(2): *pp.* 165-170, February. [online]. Available from: <www.healthsystem.virginia.edu/internet/epinet> [Accessed 18. December, 2007].

Bak, N. 2003. **Guide to Academic Writing.** University of the Western Cape, [Online].

Bandolier Extra, 2003. Needle stick injuries. **Evidence-based health care**, [Online]. Available from: <http://www.ebandolier.com> [Accessed 14 December, 2008].

Beltrami, E.M., Williams, I.T., Shapiro, C.N. & Chamberland, M.E. 2000. Risk and management of blood borne infections in health care workers. **Clinical Microbiology Rev 2000**, [online]. 13: *pp.* 385-40, Available from: <http://www.vhpb.org/files/html/Meetings_and_publications/Premeeting_documents/ROMpremeetdoc.pdf> [Accessed 30 April, 2008].

Bhat, G., Patnaik, B., Pratinidhi, A., Gupte, A. & Desai, A. 2004. Knowledge and Awareness amongst the Nursing Students Regarding Risk of HIV Infection through Accidental Needle Stick Injury. **Indian Journal of Community Medicine,** Volume XXIX (3): *pp.* 143-144, July-September.

Bi, P., Tully, P.J., Pearce, S. & Hiller, J.E. 2006. Occupational blood and body fluid exposure in an Australian teaching hospital. **Epidemiology and Infection,** 134(3): *pp.* 465-471, June.

Boal, W.L., Leiss, J.K., Sousa, S., Lyden, J.T., Li, J. & Jagger, J. 2008. The National study to prevent blood exposure in paramedics: Exposure reporting. **American Journal of Industrial Medicine,** 51(3): *pp.* 213-222, March.

Bohnker, B. & Bowman, W. 2005. Needle-stick epidemiology in navy health care workers based on INJTRAK reports 2001-2002. **Military Medicine**, 170(12): *pp.* 1034-1036, December.

Booyens, S.W., 1998. **Dimensions of Nursing Management**. 2nd ed. South Africa: Creda Press.

Burns, N. & Grove, K. 2005. **The Practice of Nursing**. 4th ed. Pennsylvania: W.B. Saunders Company.

Calfee, D. 2006. Prevention and Management of Occupational Exposures to Blood Borne Pathogens**.** **New York.** *pp. 6* [online]. Available from: <http://www.mssm.edu/msjournal/73/73_6_pages_852_856.pdf> [Accessed 30 April 2008].

Canadian Centre for Occupational Health & Safety. 2005. **Needle Stick Injuries.** [Online], Available from: <http://www.ccohs.ca/oshanswers/diseases/needlestick_injuries.html_> [Accessed 30 April, 2008].

Carter, M. 2007. HIV-1 infection in persistently HIV-1 sero-negative individuals: more reasons for HIV RNA screening. **Clinical Infectious Diseases** [online]. Available from: <http://www.aidsmap.com/en/news/C30FBBD2-588A-441D-9E88-83F59309887F.asp> [Accessed 11 March, 2008].

Centers for Disease Control & Prevention (CDC). 1985. **Standard Precautions: Infection Control** [Online], Available from: <http://www.moondragon.org/obgyn/pregnancy/standardprecaution.html>[Accessed 30 April, 2008].

Centers for Disease Control & Prevention (CDC). 2001. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Post exposure Prophylaxis. **Morbidity and Mortality Weekly Report, 50--RR-11** [online]. Available from: <http://www.cdc.gov/mmwr/PDF/rr/rr5011.pdf> [Accessed 19 March, 2008].

Centers for Disease Control & Prevention (CDC). 2002 **A Guide to the Handling and Disposal of Medical Waste** [online]. Available from: <http://www.auburn.edu/administration/rms/pdf/medical-waste-disposal.pdf >[Accessed 05 March, 08].

Centers for Disease Control & Prevention (CDC). 2003. **Guidelines for Infection Control in Dental Health Care Settings** 2003. **Morbidity and Mortality Weekly Report 52(RR 17),** *pp.* 1-61 December 19 [online]. Available from: <http://www.27802211.com/ice/program/program11.htm> [Accessed 05 March 2008].

Centers for Disease Control & Prevention (CDC). 2004. **Workbook for Designing, Implementing and Evaluating a Sharp Injury Prevention Program** [online]. Available: from: <http://www.cdc.govsharpssafety/wk.-operational-education.html > [Accessed 05 March, 08].

Centers for Disease Control & Prevention. 2005. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HIV and Recommendations for Post-exposure Prophylaxis. **Morbidity and Mortality Weekly Report** [online]. 54(RR09): *pp.* 1-17, September. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5409a1.htm>[Accessed 29 February, 2009].

Centers for Disease Control & Prevention (CDC). 2007. Medicine Net.com –Medicine Dictionary [online]. Available from: <http://www.medterms.com/script/main/art.asp?articlekey=25492 > [Accessed 13 August, 2007].

Centers for Disease Control & Prevention (CDC). 2008. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Post exposure Prophylaxis. **Morbidity and Mortality Weekly Report 50--RR-11,** [online]. Available from: <http://www.cdc.gov/mmwr/PDF/rr/rr5011.pdf> [Accessed 27 February 2009].

Chair, C.H.S. 2003. Sharps Management and Sharps Injury Protocol. **Edith Cowan University,** *pp. 6* [online]. Available from: <www.chs.ecu.edu.au/org/osh/documents/procedures/index/html> [Accessed 09 October, 2007].

Chapman, R. 2004. **Department of Health Business Plan 2004-2005.** Free State: Government Printers.

Chief Medical Officers' Expert Advisory Group on AIDS. 2008. HIV post-exposure prophylaxis. [online]. *pp.* 1-75, September. Available from: <http://www.injurybenefit.nhsbsa.nhs.uk/> [Accessed 17 March, 2009].

Clarke, S.P., Sloane, D.M. & Aiken, L.H. 2002. Effects of Hospital Staffing and Organizational Climate on Needlestick Injuries to Nurses**. American Public Health Association,** 92(7): *pp.* 1115-1119, July. [online]. Available from: <http://www.nursingworld.org/ojin/topic25/tpc25_4.htm#ANA0> [Accessed 09 October, 2007].

Cowles, L. 2004. **The Point of the Matter Nurses,** [online]. 6(17): *pp.* 43-45, July. Available from: <http://www.google.co.za/search?q=http%3A%2F%2Fwww.cdc.gov%2Fniosh%2Fndlatest.html&btnG=Search&hl=en&sa=2> [Accessed 15 December, 2008].

Crombie, I. & Davies, H.T.O. 1997. **Research in health care** 4Tth ed. England: W.B. Saunders Company.

Cullinan, K. 2006. **Health services in South Africa: a basic introduction** [online]. Available from: <http:www//health.gov.za> [Accessed 7 October, 2006].

Cummings, R. 2003. Post Exposure Prophylaxis for HIV Blood borne Virus and Sexually Transmitted Infections. **The Alfred** [online]. Available from: <http://www.hivhepsti.info/fs/pep.htm> [Accessed 17 March, 2009].

Dannetun, E., Tegnell, A., Torner A. & Giesecke, J. 2006. Coverage of Hepatitis B vaccination in Swedish healthcare workers. **Journal of Hospital Infection,** 63(2): *pp.* 201-204, January.

De Graaf, R., Houweling, H. and Van Zessen, G. 1998. Occupational risk of HIV infection among Western health care professionals posted in AIDS endemic areas. **AIDS CARE**. 10(4): *pp.* 441-452, August.

De Villiers, H.C., Nel, M. & Prinsloo, E.A.M. 2007. Occupational exposure to blood borne viruses amongst medical practitioners in Bloemfontein, South Africa. **South Africa Family Practice,** 49(3): *pp.* 14, [online]. Available from: <http://www.safpj.co.za/index.php/safpj/article/viewFile/545/683> [Accessed 28 December, 2007].

De Vos, A.S., Strydom, H., Fouché, C.B. & Delport, C.S.L. 2004. **Research at grass roots: For the social sciences and human service professions***.* 2nd ed. Pretoria: Van Schaik.

Department of Health**.** 2005. Recommendations on infection control practice for HIV transmission in health care settings. **Scientific Advisory Council Committee on AIDS: Centre for health protection, Hong Kong.** *pp.* 3 January [online]. Available from: <http://www.27802211.com/ice/program/program11.htm> [Accessed 05 March, 2008].

Dieleman, M., Bwete, V., Maniple, E., Bakker, M., Namaganda, G., Odaga J. & van der Wilt G. 2007. 'I believe that the staff have reduced their closeness to patients': an exploratory study on the impact of HIV/AIDS on staff in four rural hospitals in Uganda. **Bio Medical Central,** 7(205): *pp.* 6963-6967, December. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?pmid=18088407> [Accessed 17 June, 2009].

Diprose, P., Deakin, C.D. & Smedley, J. 2000. Ignorance of post exposure prophylaxis guidelines following HIV needle stick injury may increase the risk of seroconversion. **British Journal of Anaesthesia**, 84(6): *pp.* 767-770, December.

Division of Nosocomial and Occupational Infections Bureau of Infectious Diseases Laboratory Centre for Disease Control Health Protection Branch**.** 2002. **Advisory notice: Canada Communicable Disease Report**, [online]. Available from: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/96vol22/dr2217.html> [Accessed 13 March, 2008].

Dorrington, R.E., Bradshaw, D., Johnson, L. & Budlender, D. 2005. **South Africa National HIV Prevalence Incidence Behaviour and Communication Survey** [online]. Available from: <http://www.journaids.org/statistics.php> [Accessed 12 December, 2006].

Ebrahimi, H. & Khosravi, A. 2007. Needle stick Injuries among Nurses. **Journal Research in Health Sciences,** 7(2): *pp.* 56-62. October, [online]. Available from:<http://www.umsha.ac.ir/jrhs/Upload/8%20Khosravi.pdf> [Accessed 14 August, 2009].

Erdem, Y. & Talas, M.S. 2006. Blunt and penetrating object injuries in housekeepers working in a Turkish University Hospital. **American Journal of Infection Control,** 34(4): *pp.* 208-214, May.

Exposure Prevention Information Network. 2003. **Disposal of contaminated needles and blood tube holders** [online]. Available from: <http://www.osha.gov> [Accessed 18 December, 2007].

Free State. Department of Health. Provincial Occupational Health Unit. 2005-2007. **The Free State Strategic Plan.** *pp.*4-5 Bloemfontein: Government Printer.

Freedman, P.N. 2002. Protective and Preventative Measures. **Alasbimn Journal,** [online]. 5(18): *pp.* 1-7, October. Available from: <http://www2.alasbimnjournal.cl/alasbimn/CDA/imprime0.1208,PRT%253D475,00.html > [Accessed 05 April, 2009].

Gańczak, M., Milona, M. & Szych, Z. 2006. Nurses and occupational exposures to blood borne viruses in Poland. **Infection Control & Hospital Epidemiology,** 27(2): *pp.* 175-180. February.

Garner, J.S., 1996. Infection Control Practices Advisory Committee. Guideline for isolation in precaution in hospitals. Part I. Evolution of isolation practices, Hospital Infection Control Practices Advisory Committee. **American Journal of Infection Control,** [online]. 24(1): *pp.* 24-31, February. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5116a1.htm> [Accessed 14 December, 2006].

Gerberding, J.L. 2005**.** Prophylaxis for occupational exposure to HIV. New South Wales department of health Policy Directive: HIV, Hepatitis B & Hepatitis C-Management of Health Care Workers Potentially Exposed. **Annals of Internal Medicine,** 125 (6): *pp.* 497-501, [online]. Available from: <http://www.health.nsw.gov.au/policies/pd/2007/PD2007_036.html> [Accessed 13 March, 2008].

Gershon, R**.** 2007. Prevalence and risk factors for blood borne exposure and infection in correctional healthcare workers. **Infection Control & Hospital Epidemiology,** 28(1): *pp.* 24-30.January.

Gershon, R.R.M, Pogorzelska, M., Qureshi, K.A. & Sherman, M. 2008. Home health care registered nurses and the risk of percutaneous injuries: a pilot study. **American Journal of Infection Control,** 36(3): *pp.* 165-172, April.

Gershon, R.R.M., Sherman, M., Mitchell, C., Vlahov, D., Erwin, M.J., Lears, M.K., Felknor, S., Lubelczyk, R.A. & Alter M.J. 2007. Prevalence and risk factors for blood borne exposure and infection in correctional healthcare workers. **Infection Control & Hospital Epidemiology,** 28(1): *pp.* 24-30. January.

Gibbon, C J. 2005. South African Medicines Formulary. 2005. **Occupational Post Exposure Prophylaxis (PEP) recommendations** *pp* 311. South African Medicines Association. Health and Medical Publishing Group.

Global AIDS Epidemic Update. 2005. **Estimating the Risk of Sexual HIV -PEP is theoretically** available **at all public sector hospitals and clinics**. November. [online]. Available from: <http://www.journaids.org/prevention.php> [Accessed 28 February, 2009].

Grant, K.B, Strode, A. & Smart, R. 2002. Managing HIV/AIDS in the workplace: A guide for government departments. **The Information Project,** *pp.* 20, July.

Gray, T. 2002. Montana state hospital policy and procedure on handling needles & sharps. *pp.* 1-3. December. [online]. Available from: <http://msh.mt.gov/volumeii/infectioncontrol/managementemployeewithoccupationalexposure.pdf> [Accessed 12 March, 2007].

Green-McKenzie, J. & Shofer, F.S. 2007. Duration of time on shift before accidental blood or body fluid exposure for house staff, nurses, and technicians. **Infection Control & Hospital Epidemiology,** 28(1): *pp.* 5-9, January.

Gurubacharya, D.L, Mathura, K.C. & Karki, D.B. 2003. Knowledge, attitude and practices among health care workers on needle-stick injuries. **Kathmandu University Medical Journal,** 1(2): *pp.* 91-94. April-June.

Hassan, A. & Khalid, A. 2001. Some Epidemiological Aspects of Needle Stick Injuries among the hospital health care workers: Eastern Province, Saudi Arabia. **European Journal of Epidemiology,** 17(5): *pp.* 401-407, July.

Hassim, I.N. 2007. Needle sticks injury among medical personnel in Accident and Emergency Department of two teaching hospitals. **Medicine Journal Malaysia,** 62(1): *pp* 9-12, March.

Health Protection Agency, Centre for Infections, National Public Health Service for Wales, CDSC Northern Ireland and Health Protection Scotland. 2008. United Kingdom surveillance of significant occupational exposures to blood borne viruses in healthcare workers. **Eye of the Needle** November, [online]. Available from: <www.hpa.org.uk/needle> and <http://www.hpa.org.uk/hpr/archives/2008/news4808.htm#oebbvs> [Accessed 05 April, 2009].

Hiransuthikul, N., Tanthitippong, A. & Jiamjarasrangsi, W. 2006. Occupational exposures among nurses and housekeeping personnel in King Chulalongkorn Memorial Hospital. **Journal of Medicine Association,** Thailand. 89(3): *pp.* 140-149, September.

International Labor Organization (ILO). 1985. **Convention on Occupational Health Services No. 161 & 171** [online]. Available from: <http://www.agius.com/hew/resource/ohsilo.htm> [Accessed 14 December, 2006].

Jagger, J. & Parker, B. 2001. Sharps Injury Prevention Workbook: *Operational Processes*. **International Healthcare Worker Safety Center: University of Virginia, United States**, Version 1-3, *pp.* 1-65, December. [online]. Available from: <http://www.mtpinnacle.com/pdfs/CDCSharpsPgm.pdf> [Accessed 28 December, 2007].

Jagger, J. 2007. Caring for Healthcare Workers: A Global Perspective. **Infection Control Hospital Epidemiology,** 28(1): *pp.* 4, January.

Janjua, N.Z., Razaq, M., Chandir, S., Rozi, S. & Mahmood, B. 2007. Poor knowledge predictor of non-adherence to universal precautions for blood borne pathogens at first level care facilities in Parkinstan. **Bio Medical Central Infectious Diseases,** 7(81): *pp.* 1471-2334 July.

Jayanth, S.T., Kirupakaran, H., Brahmadathan, K.N., Gnanaraj, L. & Kang, G. 2009. Needle stick injuries in a tertiary care hospital. **Indian Journal of Medical Microbiology,** 27(1): *pp*. 44-47, April.

Jeong, I., Cho, J. & Park, S. 2008. Compliance with standard precautions among operating room nurses in South Korea. **American Journal of Infection Control** [online], 36(10): *pp.* 739-742, December. Available from: <http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6W9M-4TRHBYM-1&_user=736898&_coverDate=12%2F31%2F2008&_rdoc=13&_fmt=high&_orig=browse&_srch=doc-info(%23toc%236686%232008%23999639989%23758067%23FLA%23display%23Volume)&_cdi=6686&_sort=d&_docanchor=&_ct=40&_acct=C000040978&_version=1&_urlVersion=0&_userid=736898&md5=d53dfef5c8cc0f78cbb560bc9d191e99>

[Accessed 15 December, 2008].

Jovic-Vranes, A., Jankovic, S. & Vranes, B. 2006. Safety Practices and professional Exposure to Blood and Blood containing Materials in Serbian Health Care Workers. **Journal of Occupational Health,** 48(5): *pp.* 377-382 June.

Karstaedt, A. & Pantanowitz, L. 2001. Occupational Exposure of Interns to blood in an area of high HIV seroprevalence. **South African Medical Journal,** 91(1): *pp.* 57-61, January.

Katzenellenbogen, J.M., Joubert, G. & Abdool-Karim, S.S. 1997. **Epidemiology: A manual for South Africa.** 1st ed. Cape Town: Oxford University Press.

Kim, J.C., Martin, L.J. & Denny, L. 2003. Rape and HIV post-exposure prophylaxis: addressing the dual epidemics in South Africa. **Reproductive Health Matters** [online], 11(22): *pp.* 101-112, November. Available from: <http://www.rhmjournal.org.uk> [Accessed 26 June, 2006] and <http://web.wits.ac.za/NR/rdonlyres/FB7C7BE5-3091-4747-9A92-E2A26A1A3789/0/RapeandPEPKimetal.pdf>
[Accessed 15 December, 2008].

Kowalska, J.D., Firlag-Burkacka, E., Niezabitowska, M., Bakowska, E., Gizińska, J., Higersberger, J., Ignatowska, A., Karczewski, G., Pulik, P., Święcki P. & Horban, A. 2006. Post-exposure prophylaxis (PEP) of HIV infection in out-patient clinic of a hospital for infectious diseases in Warsaw in 2001-2002. **Journal of Epidemiology,** 60(4): *pp.* 789-794, March, [online]. Available from: <www.zakazny.pl/.../0711Tolerability%20and%20adherence%20to%20postexposure%20prophylaxis%20of%20HIV%20infection%20in%20dif> [Accessed 15 July, 2009].

Lee, J.M., Botteman, M.F., Nicklasson, L., Cobden, D. & Pashos C.L**.** 2005. Needle stick injury in acute care nurses caring for patients with diabetes mellitus: a retrospective study. **Medscape Today,** 21(5): *pp.* 741-747, [online]. Available from: <http://www.medscape.com/viewarticle/505649_3> [Accessed 05 April, 2009].

Leigh, J.P., Gillen, M., Franks, P., Sutherland, S., Nguyen, H.H., Steenland, K. & Xing, G. 2007. Costs of needlestick injuries and subsequent hepatitis and HIV infection. **Current Medical Research and Opinion,** 23(9): *pp.* 2093-2105, September. [online]. Available from: <http://www.informapharmascience.com/toc/cmo/23/9> [Accessed 19 December, 2008].

Makary, M.A., Al-Attar, A., Holzmueller, C.G.l., Syin, D., Gilson, M.M., Sulkowski, M.S. & Pronovost, P.J. 2007. Needle stick injuries among surgeons in training**. New England Journal of Medicine,** 356 (26): *pp.* 2693-2699 June, [online]. Available from: <http://www.ncbi.nlm.nih.gov/sites/entrez?orig_db=PubMed&db=PubMed&cmd=Search&term=New%20England%20Journal%20of%20Medicine%5BJour%5D%20AND%202007%5Bpdat%5D%20AND%20Makary%20M%5Bauthor%5D>and<www.healthsystem.virginia.edu/internet/epinet> [Accessed 18 December, 2007].

Manian, F.A. & Ponzillo, J.J. 2007. Compliance with routine use of gowns by healthcare workers (HCWs) and non-HCW visitors on entry into the rooms of patients under contact precautions. **Infection Control & Hospital Epidemiology,** 28(3): *pp.* 337-340, March.

Marais, B. & Cotton, M. 2003. Occupational Exposure to Human Immunodeficiency Virus in Pediatricians. **The Pediatric Infectious Disease Journal,** 22(4): *pp.* 382-3, April.

McCracken, J. 2008. United Kingdom Surveillance of Significant Occupational Exposures to Blood borne Viruses in Healthcare Workers**. Health Protection Agency** *pp.* 1-64, November, [online]. Available from: <www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1227688128096>[Accessed 05 April, 2009].

McGaw, T., Peters, E. & Holton, D. 2000. Dental Students with hepatitis B e antigen: a survey of Canadian dental schools. **Journal of Canadian Dental Association,** 66: *pp.* 562-563.

Mijch, A., Price B & Wright, E. 2003. Post exposure Prophylaxis for HIV. **Victorian HIV/AIDS Service** [online]. Available from: <http://www.hivhepsti.info/fs/pep.htm> Accessed 07 July, 2009.

Millar, R.J. 2005. Hygiene Highlight: An updated perspective on need stick injuries. **Nikos Medicals,** [Online]. Available from: <http://www.nikosmedical.com/needleinjury.htm> [Accessed 30 April 2008].

Moody, A. 2002. **A qualitative Inquiry into Doctors Experience after a needle stick injury.** 1st ed. South Africa: 1-152. Rand Afrikaans University Printers.

Naghavi, H.R. & Sanati, K.A. 2009. Accidental blood and body fluid exposure among doctors. **Occupational Medicine** 59(2): *pp.* 101-106, January.

National Institute for Occupational Safety and Health. 2004**.** Preventing Needlestick Injuries in Health Care Settings. [online], Available from: <http://www.cdc.gov/niosh/ndletest.html> [Accessed 19 December, 2007].

Noble, R. & Spink, G. 2008. **Health care worker and HIV Prevention: Nurse contracted HIV from patient** [online]. Available from: <http://www.avert.org/contact.htm> [Accessed 24 April, 2008].

Nursing for nurses, 2005. **What's the straightDope on recapping needles?**. [online]. Available from: <http://allnurses.com/general-nursing-discussion/whats-straightdope-recapping-102777-page2.html> [Accessed 12 August, 2009].

Nyantumbu, B. & Geyer N. 2004. World Health Organisation and International Council of Nurses Project: Prevention of needle stick injury and transmission of HIV in health care workers. **Safe Injection Global Network (SIGN),** Report of the Global Infection Control and Injection Safety Meeting. Cape Town, South Africa. [online]. Available from <http://www.who.int/injection_safety/SIGNCPTFinalReportCleared.pdf>
[Accessed 18 December, 2007].

O'Malley, E.M., Scott, R.D. & Gayle, J. 2007. Costs of management of occupational exposures to blood and body fluids. **Infection Control & Hospital Epidemiology,** 28(7):774-782 [online]. Available from: <www.healthsystem.virginia.edu/internet/epinet> [Accessed 18 December, 2007].

Oosthuizen, F.S. de W. 2008. **Guideline: Management of occupational exposures to HIV, HBV, HCV and recommendations for post exposure prophylaxis** *pp* 1-28. Free State Provincial Occupational Health Unit.

Orenstein**,** R., Reynolds, L., Karabaic, M., Lamb, A. & Markowitz S.M. 2000. Needle stick injury prevention [online], Available from: <http://www.injectionsafety.org> [Accessed 29 June, 2004 and 17 January, 2009].

Oswald, T. 2007. Healthcare Workers Infected with Blood-Borne Illnesses in Canada. **Healthcare Quarterly**, 10(4): *pp.* 64-73, February.

Peng, B., Tully, P.J., Boss, K. & Hiller, J.E. 2008. Sharps Injury and Body Fluid Exposure among Health Care Workers in an Australian Tertiary Hospital. **Asia Pacific Journal of Public Health,** 20(2): *pp.* 139-147, April.

Perry, J., Robinson, S.E & Jagger, J. 2004. Needle stick and sharps safety survey: Getting to the point about preventable injuries. **Nursing,** 34(4): *pp.* 43-47 April.

Polit, D.F. & Beck, C.T. 2004. **Nursing research: methods, appraisal, and utilization.** 7th ed. New York: Lippincott.

Polit, D.F. & Beck, C.T. 2006. **Essentials of nursing research: methods, appraisal, and utilization.** 6th ed. New York: Lippincott.

Polit, D.F. & Hungler, B.P. 2001. **Nursing research: principles and methods.** 6th ed. New York: Lippincott.

Polit, D.F., Beck, C.T. & Hungler, B.P. 2001. **Essentials of nursing research: methods, appraisal, and utilization**. 5th ed. New York: Lippincott.

Polit, D.F., Beck, C.T. & Hungler, P. 2001. **Nursing research: methods, appraisal, and utilization**. 5th ed. New York: Lippincott.

Prüss-Üstün, A., Rapiti, E. & Hutin, Y. 2003. Sharps injuries: Global burden of disease from sharps**. American Journal of Industrial Medicine,** 36(1): *pp.* 213-222, also [online]. Available from: <http://www.who.int/quantifying_ehimpacts/publications/9241562463/en/>

Prüss-Üstün, A., Rapiti, E. & Hutin, Y. 2005. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. **American Journal of Industrial Medicine,** 48 (6): *pp.* 482-490.

Prüss-Üstün, E. & Rapiti, Y.H. 2003. **Sharps injuries: Global burden of disease from sharps injuries to health-care workers** [online], Available from: <http://www.who.int/quantifying_ehimpacts/publications/9241562463/en/phedoc@who.int> [Accessed 24 April, 2008].

Rantanen, J. 2007. Global plan of action on occupational health 2008 – 2017 Updated 11 May 2007. Finland with support from the Finnish Institute of Occupational Health. [online]. Available from: <http://www.who.int/occupational_health/en/oehstrategy.pdf> [Accessed 04 January, 2005].

Rantanen, J. 2007. Global Strategy on Occupational Health for All: The Way to Health at Work. **World Health Organization** (Online), 1(802): *pp.* 50-65, July. Available from: <http://www.who.int/occupational_health/en/oehstrategy.pdf> and http://www.who.int/occupational_health/publications/globstrategy/en/index.html [Accessed 23 April, 2007].

Rele, M., Mathur, M. & Turbadkar, D. 2002. Risk of needle stick injuries in health care workers. **Indian Journal of Medical Microbiology,** 20(4): *pp.* 206-207.January.

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR). 2005. **Needle stick injuries. Royal College of Nursing (2005) "Good Practice in Infection Prevention and Control Guidance for Nursing Staff".** London: RCN Publication Code 002 741, August [online]. Available from: http://www.hse.gov.uk/healthservices/needlesticks/ Accessed 12 August, 2009].

Richard, V.S., Kenneth, J., Cherian, T. & Chandy, G.M. 2000. Preventing transmission of blood-borne pathogens to health care workers. **National Medical Journal India,** 13: *pp.* 82-85.

Robson, C. 2003. **Real world research: A resource for social scientists and practitioner researchers**. 2nd ed. Great Britain: Blackwell Publishers.

Saberifiroozi, M., Gholamzadeh, S. & Serati A-R. 2006. Long-term immunity amongst health care workers vaccinated against hepatitis B virus in a large referral hospital in Southern Iran. **Archives of Iranian Medicine**, 9(3): *pp.* 204–207, July.

Sanchez-Ortiz, A. D. 2007. Needle stick injuries among surgical residents in training. *In*: Makary, M.A., Al-Attar, A., Holzmueller, C.G.I., Syin, D., Gilson, M.M., Sulkowski, M.S. & Pronovost, P.J. **Needle stick injuries among surgeons in training** *pp.* 2693-2699.

Saulat, J. 2005. Epidemiology of needle stick injuries among health care workers in a secondary care hospital in Saudi Arabia. **Annals of Saudi Medicine,** 25(3): *pp.* 233–238 December.

Sehulster, L. & Chinn, R.Y.W. 2003. Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations and Reports. **Morbidity and Mortality Weekly Report, 52, (RR10),** *pp.* 1-43. [Online]. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm><https://www.accesscontinuingeducation.com/ACE1000-08/references/index.htm> [Accessed October 2005].

Sepkowitz, K.A. 2005. Infection control policy directive: HIV, Hepatitis B & Hepatitis C - Management of Health Care Workers Potentially Exposed. **New South Wales Government Department of Health.** *pp*. 917-928 [online]. Available from: <http://www.health.nsw.gov.au/policies/pd/2007/PD2007_036.html>
[Accessed 13 March, 2008].

Shai-Mhatu, P. 2006. **Free State Antiretroviral (ARV) roll out plan**. Free State: Government Printer.

Shai-Mhatu, P. 2006. Free State Department of Health Business Plan. **Acta Academica Supplementum,** (1): *pp.* 94-139.

Siegel, J.D., Rhinehart, E., Jackson, M. & Chiarello, L. 2007. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. [online]. Available from: <http://www.cdc.gov/ncidod/dhqp/gl_isolation_contact.html> [Accessed 06 March, 2008].

Singh, R. 2004. Impact of needle stick injuries on healthcare workers. **Factsheet,** 24: *pp.* 1-4, December. [online]. Available from: <http://www.bvsde.paho.org/bvsacd/cd48/timely.pdf> [Accessed 12 August, 2009].

Singru, S.A. & Banerjee, A. 2008. Occupational exposure to blood and body fluids among health care workers in a teaching hospital in Mumbai, India. **Indian Journal of Community Medicine,** 33(1): *pp.* 26-30, December.

Smith, D.K., Grohskopf, L.A., Black, R.J., Auerbach, J.D., Veronese, F., Struble, K.A., Cheever, L., Johnson, M., Paxton, L.A., Onorato, I.M. & Greenberg, A.E. 2005. Post Antiretroviral Exposure Prophylaxis after Sexual, Injection, Drug Use, or Other Non-occupational Exposure to HIV in the United States. **Morbidity and Mortality Weekly Report***,* 21;54 (RR02): *pp.* 1-20,January, [online]. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5402a1.htm> Accessed 10 July, 2009

Smith, D.R., Choe, M.A., Jeong, J.S., Jeon, M.Y., Chae, Y.R. & An, G.J. 2006. Epidemiology of needle stick and sharps injuries among professional Korean nurses. **Journal of Professional Nursing,** 22(6): *pp.* 359-366, April.

Smith, D.R., Mihashi, M., Adachi, Y., Nakashima, Y. & Ishitake, T. 2006. Epidemiology of needle stick and sharps injuries among nurses in a Japanese teaching hospital. **Journal of Hospital Infection,** 64(1): *pp.* 44-49, September.

Smith, D.R., Smyth, W., Leggat, P.A. & Wang, R.S. 2006. Needles stick and sharps injuries among nurses in a tropical Australian hospital. **Internal Journal Nursing Practice,** 12(2): *pp.* 71-77, March.

South Africa. 1993 **The Occupational Health and Safety Act, No.85 of 1993 Regulations on Hazardous Biological Agent (HBA)** [online]. Available from: <http://www.kznhealth.gov.za/occhealth/hba.pdf> [Accessed 08 January 2009].

South Africa. 1993. **Occupational Health and Safety Act and Regulations, Act 85 of 1993** (OHASA)**. Revised** 5th ed. Pretoria: Government Printer.

South Africa. 1993. **The Compensation for Occupational Injuries and Diseases Act, No 130 of 1993.** Pretoria: Government Printer.

South Africa. 2003. **National Health Act 61 of 2003**. Pretoria: Government Printer.

Spink, G. 2008. **Post Exposure Prophylaxis (PEP) and Pre Exposure Prophylaxis** *pp.*1-7 **(PREP)** [online], Available from: <http://www.avert.org/pep-prep-hiv.htm> [Accessed 24 April, 2008]

Sridhar, M.R., Boopathi, S., Lodha, R. & Kabra, S.K. 2004. Standard precautions and post exposure prophylaxis for preventing infections. **Indian Journal of Paediatrics,** 71: *pp.* 617-625, no month.

Stevens, M. & Dickinson, D. 2007. Needlestick injuries in an era of HIV: technical and personal aspects. **African Journal of AIDS Research**. 6(1): *pp.* 41–48, April.

Stevenson, A. 2000. **The Oxford Dictionary**. 2nd ed. New York: Oxford.

Steyn, D. 2005. **Recommended guidelines to all students in training in any medical, nursing or related health profession at the university of the Orange Free State regarding needle stick and sharps injuries** *pp* 1-6. Bloemfontein: Xerox Printers.

Steyn, D. 2008. Blood Borne Pathogens (BBPs) in clinical care areas**. Occupational Health Care Conference Presentation (09 October 2008).** Bloemfontein.

Steyn, F., Van Rensburg, D. & Engelbrecht, M. 2006. Human resources for ART in the Free State Public Health Sector: recording achievements, identifying challenges. **Acta Academica Supplementum,** (1): *pp.* 94-139.

Stoker, R. 2007. Strategies for Creating a Safe Workplace by Management of Infection Control Hospital Violations. **Sharps Safety,** June, [online]. Available from: <http://www.medicalsafetybook.com> [Accessed 12 August, 2009].

Subratty, A.H. & Moussa, A.C. 2007. Incidence of Needle stick injuries among health care workers in Mauritius. **Asian Journal of Biochemistry,** 2(5): *pp.* 314-322. (no month).

Syed, F., Shah A., Abdulbari Bener B., Saad Al-Kaabi C., Abdul Latif Al Khal C, & Soji Samson, B. 2006. The Epidemiology of needle stick injuries among health care workers in a newly developed country. **Safety Science,** 44(5): *pp.* 387-394 October.

Tetali, S. & Choudhury, P.L. 2006. Occupational exposure to sharps and splash: Risk among health care providers in three tertiary care hospitals in South India. **Indian Journal of Occupational and Environmental Medicine,** 10(1): *pp.* 35-40. January-April.

Tomey, A.M. 2000. **Guide to Nursing Management and Leadership**. 6th ed. Indiana: Mosby.

Trasancos, C.C., Kainer, M.A., Desmond, P.V. & Kelly, H. 2001. Investigation of potential iatrogenic transmission of hepatitis C in Victoria, Australia. **Australian and New Zealand Journal of Public Health,** 25(3): *pp.* 241-244 June; [online]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11494992?dopt> [Accessed 12 August, 2009].

Tshabalala-Msimang, M. E. 1999. South Africa **Department of Health National Policy on testing for HIV** [online]. Available from: <http://www.doh.gov.za/docs/notices/1999/not99-1479.html> [Accessed 07 April, 2008].

Tshabalala-Msimang, M.E. 1999. Speeches and statements issued by government departments and bodies, S.A. Government Information [online]. Available from: <http://www.info.gov.za/speeches/year/index.html> [Accessed 07 April, 2008].

United States (US). 1978. **Medical Waste Regulatory Act, of the Michigan Public Health Code, PA 368**, as amended. [online], Available from: <http://www.michigan.gov/documents/deq/whm-stsw-mwrp-MW-Reg-Act-Rules_257176_7.pdf> [Accessed 18 December, 2007].

United States Centre for Disease Control. 2001. Updated US Public health service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for post exposure prophylaxis. **Morbidity and Mortality Weekly Report 52, 50(RR-11)**:1-52. [online]. Available from: <http://www.27802211.com/ice/program/program11.htm> [Accessed 05 March, 2008].

United States Department of Labor. 2003. Disposal of Contaminated Needles and Blood Tube Holders. **Occupational Health and Safety Administration.** [online]. Available from: <http://www.osha.gov> [Accessed 14 December, 2006].

United States General Accounting Office. 2000. Occupational safety: selected cost and benefit implications of needle stick prevention devices for hospitals. **General Accounting Office-01-60R,** 17 November.

United States. Public Health Service. 2001**. Guidelines for the management of occupational exposures to HBV, HCV and HIV and recommendations for the post exposure prophylaxis**. Divisions of HIV/AIDS prevention national center for HIV/AIDS VIRAL hepatitis, STD, and TB prevention. [online]. Available from:

<http://www.cdc.gov.hiv> [Accessed August, 2007].

University of Cape Town (UCT) & Health and Safety Department. 2004. **Groote Schuur hospital's Needle Stick Injury Policy** [online]. Available from: <http://www.uct.ac.za/downloads/uct.ac.za/about/policies/needlestick.pdf> [Accessed 12 May, 2009]

Uys, H.H.M. & Basson, A.A. 2000. **Research methodology in nursing.** 2nd ed. Pretoria: Penrose Book Printers.

Valls, V., Lozano, M.S., Yanez, R., Martinez, M.J., Pascual, F., Lloret, J. & Ruiz, J.A. 2007. Use of safety devices and the prevention of percutaneous injuries among health care workers. **Infection Control Hospital Epidemiology,** 28(12): *pp.* 1352-1360, December.

Van Vuuren, M.V.J. 2005. **A Framework for a skills laboratory curriculum in an undergraduate medical programme in South Africa.** 1st ed. Bloemfontein: Xerox.

Venier, A.G., Vincent, A., L'Hériteau, F., Floret, N., Sénéchal, H., Abiteboul, D., Reyreaud, E.; Coignard, B. & Parneix, P. 2007. Surveillance of occupational blood and body fluid exposures among French health care workers. **Infection Control and Hospital Epidemiology** 28(10): *pp.* 1196-1201, October.

Verow, P., Blair, I. & Lees, J. 2004. Association of National Health Occupational Physicians **(ANHOPS) Guidelines: Immunization of Healthcare** Workers *pp.*4-5 [online], Available from: <http://www.anhops.com/docs/29_9_immuninisation.pdf> [Accessed 14 December, 2006].

Wang, S., Panlilio, A.L., Doi, P.A., White, A.D., Stek, M., Saah, A. & The HIV PEP Registry Group. 2000. Experience of Healthcare Workers Taking Post exposure Prophylaxis after Occupational HIV Exposures: Findings of the HIV Post exposure Prophylaxis Registry. **Infection Control Hospital Epidemiology** 21(12): *pp.* 780–785, December.

Wicker, S., Jung, J., Allwinn, R., Gottschalk, R. & Rabenau, H.F. 2008.Prevalence and prevention of needlestick injuries among health care workers in a German university hospital **International Archives of Occupational and Environmental Health** *pp.* 347-354, July.

Wikipedia. 2005. **Definition of Free State Province** [online], Available from: <http://encyclopedia2.thefreedictionary.com/Free+State+province> [Accessed 30 June, 2005].

Wilburn, S. 2001. Know Your Rights: Ensuring your employer's compliance with federal Needle stick Law. **American Journal of Nursing,** 101(3): *pp.* 90, March.

Wilburn, S. 2004. Needle stick and Sharps Injury Prevention. **Online Journal of Issues in Nursing** 9(3) Manuscript 4. [online]. Available from: <www.nursingworld.org/ojin/topic25/tpc25_4.htm> [Accessed 25 August, 2007].

Wilburn, S. 2007. Protecting health workers from occupational exposure to HIV, hepatitis and other blood borne pathogens from research to practice. **African Newsletter on Occupational Health and Safety**, 17(2): *pp.* 34, November.

Wilburn, S.Q. & Eijkemans, G. 2004. Preventing Needle Stick Injuries among Healthcare Workers: WHO–ICN Collaboration. **International Journal of Occupational and Environmental Health,** (10): *pp.* 451–456. Geneva: Switzerland.

Wilburn, S. Q. & Eijkemans, G. 2007. Asian-Pacific Newsletter on Occupational Health and Safety. **Finnish Institute of Occupational Health**, 14 (1): *pp.* 10-11. August.

Wilburn, S.Q. & Eijkemans, G. 2007. Protecting health workers from occupational exposure to HIV, hepatitis, and other blood borne pathogens: from research to practice **Asian-Pacific Newsletter on Occupational Health and Safety** [online], 14(1): *pp*. 8-12, May. Available from: <http://www.ttl.fi/NR/rdonlyres/CC3D2788-535F-4445-8A74-CE56311AE501/0/AsianPacificNewsletter12007.pdf> [Accessed 14 December, 2007].

Williams, B. 2005. **An explorative study of the experiences and the reasons why health workers report a needle stick injury**. 1st ed. University of Western Cape: University of Western Cape Printers. [online]. Available from: <http://etd.uwc.ac.za/usrfiles/modules/etd/docs/etd_init_8854_1173952972.pdf> Accessed 14 December, 2007].

World Health Organization (WHO). 2001. **HIV/AIDS Antiretroviral newsletter** [online], June 2001, Issue No.5. Available from: <http://www.wpro.who.int/NR/rdonlyres/71726D3C-A3F4-4C4F-9FA1-E644DF3FEC34/0/ART_Newsletter_Issue_5.pdf> [Accessed 20 June, 2008].

World Health Organization (WHO). 2003. **Injection safety toolbox** [online], Available from: <http://www.who.int/injection_safety/toolbox/docs/en/AM_HCW_Safety.pdf > [Accessed 20 June, 2007].

World Health Organization (WHO). 2003. **Strategy to protect health workers from blood borne infection** [online], Available from: <http://aidsinfo.nih.gov/contentfiles/HealthCareOccupExpoHBV-HCV-HIV_GL.pdf> [Accessed 24 April, 2008].

World Health Organization (WHO). 2005. Definitions of Universal Precaution (UP) [online]. Available from:
<http://medical-dictionary.thefreedictionary.com/standard+precautions>
[Accessed 12 June, 2007].

World Health Organization (WHO) & International Labor Organization (ILO) Geneva. 2006. **The Workers health: Global Plan of Action (GPA) on Workers Health 2008-2017** [online], Available from:
<http://www.ilo.org/public/english/protection/safework/labinsp/dussconf_07/cd/neira_ppt.pdf > [Accessed 20 June, 2007].

Yang, Y-H., Liou, S-H., Chen, C-J., Yang, C-Y., Wang, C-L., Chen, C-Y. & Wu, T-N. 2007. The Effectiveness of a Training Program on Reducing Needle Stick Injuries/Sharp Object Injuries among Soon Graduate Vocational Nursing School Students in Southern Taiwan. **Journal Occupational Health**, 49(5): *pp.* 424-429, June.

Annexure A:

Approval of the research proposal of the Ethics Committee, Faculty of Health Sciences, University of the Free State

UNIVERSITEIT VAN DIE VRYSTAAT
UNIVERSITY OF THE FREE STATE
YUNIVESITHI YA FREISTATA

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Fakulteit Gesondheidswetenskappe / Faculty of Health Sciences
Research Division
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☎(051) 4052812
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Ms H Strauss 2007-03-16

MS LE NOPHALE
DEPT OF COMMUNITY HEALTH
FACULTY OF HEALTH SCIENCES
UFS

Dear Ms Nophale

ETOVS NR 22/07
RESEARCHER: MS LE NOPHALE
PROJECT TITLE: REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN DISTRICTS OF THE FREE STATE PROVINCE.

You are hereby kindly informed that the Ethics Committee finally approved the above-mentioned protocol at their meeting held on 13 March 2007.

Your attention is kindly drawn to the following:

- A progress/final report have to be submitted after completion of the study or within a year after approval of the project
- That all extentions, amendments, serious adverse events, termination of a study etc have to be reported to the Ethics Committee
- These documents have been accepted as complying with the Ethics Standards for Clinical Research based on FDA, ICH GCP and Declaration of Helsinki guidelines as well as the Clinical Trials Guidelines 2000: Dept of Health RSA and MRC Guidelines on Ethics for Medical Research

Will you please quote the Etovs number as indicated above in subsequent correspondence to the secretariat.

Yours faithfully

DIRECTOR: FACULTY ADMINISTRATION
CC Dr A Joubert, School of Nursing, UFS

UNIVERSITEIT VAN DIE VRYSTAAT
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Ms H Strauss

2007-07-30

MS LE NOPHALE
SCHOOL OF NURSING
UFS

Dear Ms Nophale

ETOVS NR 22/07
PROJECT TITLE: REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN DISTRICTS OF THE FREE STATE PROVINCE.

- You are hereby informed that at the meeting on 24 July 2007 The Ethics Committee approved the following:
- *Amendments to the questionnaire*
- The following documents are used by the Ethics Committee as guidance documents: Declaration of Helsinki, ICH, GCP and MRC Guidelines on Bio Medical Research. Clinical Trial Guidelines 2000 Department of Health RSA; Ethics in Health Research: Principles Structure and Processes Department of Health RSA 2004; the Constitution of the Ethics Committee of the Faculty of Health Sciences and the Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines.
- Any amendment, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.
- The Committee must be informed of any serious adverse event and/or termination of the study.
- A progress report should be submitted within one year of approval of long-term studies and a final report at completion of both short term and long term studies.
- Please refer to the ETOVS reference number in correspondence to the Ethics Committee secretariat.

Yours faithfully

.....

for **PROF BB HOEK**
CHAIR: ETHICS COMMITTEE

Annexure B:

1. **Application letter for conducting the study in the Free State Province Department of Health (DoH) public health sector regional hospitals sent to the Acting Head (HoD): Department of Health**
2. **Approval for conducting the study in the Free State Province Department of Health (DoH) public health sector regional hospitals obtained from the Acting Head (HoD): Department of Health**

10328 SIMUNDA STREET
ROCKLANDSLOCATION
BLOEMFONTEIN
9323
09 OCTOBER 2006

DR R. CHAPMAN
ACTING HEAD OF HEALTH
BOPHELO HOUSE
BLOEMFONTEIN
9300

RE: APPROVAL TO CONDUCT RESEARCH ON NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE.

Dr R. Chapman

I am currently registered at the University of the Orange Free State in Bloemfontein for a Master's Degree in Nursing.

My study is about Needle Stick Injuries (NSIs) amongst health care workers of Regional Hospitals in the Free State Province. The study is also relevant to my work as the Provincial Occupational Health Unit Nurse

Information collected will not be linked to the respondent's name meaning that no names will appear on the questionnaire or reports.

I will greatly appreciate it if you will give approval and permission for conducting the study. The date for the pilot study and data collection is not yet finalized. The study will be presented to department of health, during Occupational Health Conferences and will be published.

Attached please find a copy of the protocol and the Ethics Committee, Faculty of Health Sciences approval letter.

Yours sincerely

MRS. L.E. NOPHALE
Student no: 199934291
Tel: 051 4053535 / 0731935154

FREE STATE PROVINCE

10328 Simunda Street
Rocklands Location
BLOEMFONTEIN
9323

Dear Mrs. L.E. Nophale

RE: APPROVAL TO CONDUCT RESEARCH REPORTED NEEDLE STICKS INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE-STATE PROVINCE.

The above-mentioned correspondence bears reference.

Approval is hereby granted for you to do the study on needle stick injuries in the Regional Hospitals in the Free State Province.

Regards

DR RD CHAPMAN
ACTING HEAD: HEALTH

DATE: 29 MARCH 2007

R RD CHAPMAN
ACTING HEAD: HEALTH

Annexure C:

1. **Application letters for conducting the study in the Free State Province Department of Health (DoH) public health sector to the regional hospitals Chief Executive Officers (CEOs)**
2. **PERMISSION for conducting the study in the Free State Province Department of Health (DoH) public health sector obtained from the regional hospitals Chief Executive Officers (CEOs)**

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FACULTY OF HEALTH SCIENCES
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BLOEMFONTEIN
9300
12 APRIL 2007

CEO/ACTING CEO
BOITUMELO HOSPITAL
KROONSTAD

Dr/Sir/Me

RE: APPROVAL TO CONDUCT RESEARCH ON REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE.

I am currently registered at the University of the Orange Free State, Bloemfontein for a Master's Degree in Nursing (Occupational health Research).

My study is about Reported Needle Stick Injuries (NSI) amongst Health Care Workers of Regional Hospitals in the Free State Province and is relevant to my work as the Provincial Occupational Health
Unit Nurse

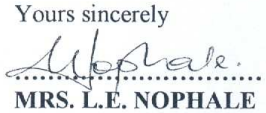
Information collected will not be linked to the any respondent's name, meaning that no names will appear on the questionnaire or in the final report.

I will greatly appreciate it if you will give permission for conducting the study. The date for the pilot study and data collection will depend on availability of respondents; anticipated month to start is April 2007 until needed data is obtained. The Occupational Health Clinics will be facilitating the data collection process as well as the researcher.

The study will be presented to department of health, during Occupational Health Conferences and will be published.

Attached find a copy of protocol approval by Ethics Committee, UFS Faculty of Health Sciences and approval letter from Dr R. D. Chapman the then Acting Head: Health.

Yours sincerely



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9300
12 APRIL 2007

CEO/ACTING CEO
BONGANI HOSPITAL
WELKOM

Dr/Sir/Me

RE: APPROVAL TO CONDUCT RESEARCH ON REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE.

I am currently registered at the University of the Orange Free State, Bloemfontein for a Master's Degree in Nursing (Occupational health Research).

My study is about Reported Needle Stick Injuries (NSI) amongst Health Care Workers of Regional Hospitals in the Free State Province and is relevant to my work as the Provincial Occupational Health
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Yours sincerely

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PROVINCIAL OCCUPATIONA HEALTH UNIT
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FACULTY OF HEALTH SCIENCES
BLOCK E GROUND ROOM 217
BLOEMFONTEIN
9300
12 APRIL 2007

CEO/ACTING CEO
DIHLABENG HOSPITAL
BETHLEHEM

Dr/Sir/Me

RE: APPROVAL TO CONDUCT RESEARCH ON REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE.

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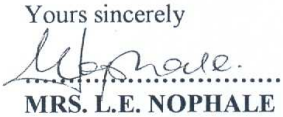
Yours sincerely



MRS. L.E. NOPHALE
Student no: 1999342916
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CEO/ACTING CEO
FREE STATE PSYCHIATRY COMPLEX HOSPITAL
BLOEMFONTEIN

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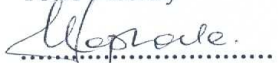

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MOFUMAHADI MANAPO-MOPELI HOSPITAL
QWA-QWA

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12 APRIL 2007

CEO/ACTING CEO
UNIVERSITAS HOSPITAL
BLOEMFONTEIN

Dr/Sir/Me

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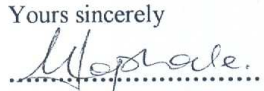

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Student no: 1999342916
Tel: 051 4053535/0731935154
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FREE STATE PROVINCE

Ms L.E. Nophale
Provincial Occupational Health Unit
P.O. Box 339 (G52) UFS
Faculty of Health Sciences
Block E Ground Room 21
BLOEMFONTEIN
9323

Ms Nophale

APPROVAL TO CONDUCT RESEARCH ON REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE

Your application refers.

Permission is hereby granted to do your research at this institution.

You are requested to adhere strictly at all times to the regulations and instructions of the hospital.

You must use your own people to conduct the research.

A copy of the final research project must be made available to the Chief Executive Officer of Bongani Hospital.

Ms I.M. Moleta, Chief Professional Nurse at the Occupation Health Clinic, will be your contact person at the hospital.

BONGANI HOSPITAL

MS ALIDA ZWIEGELAAR
CHIEF EXECUTIVE OFFICER

BONGANI HOSPITAL
A. ZWIEGELAAR
2007 -06- 11
Date: .....
CHIEF EXECUTIVE OFFICER

Ms Alida Zwiegelaar Chief Executive Officer Bongani Hospital Welkom 9460
Mothusi Avenue, Private Bag X29, Welkom 9460 Tel. 057 – 9168005 Fax 057 – 9168295
E-Mail: zwiegea@fshealth.gov.za

FREE STATE PROVINCE

25 April 2007

Ms LJ Nophale
Department of Community Health
Faculty of Health Sciences
UFS

APPROVAL TO CONDUCT RESEARCH ETOVS NR 22/07

The members of the Research and Clinical Ethics Committee approved that the above-mentioned study.

"REPORTED NEEDLE STICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS" can be conducted at FSPC

Kind regards

PROF PJ PRETORIUS
CHAIRPERSON

Department of Health ▾ Departement van Gesondheid ▾ Lefapha La Bophelo Bo Botle

PROF PJ PRETORIUS: CHIEF SPECIALIST
FREE STATE PSYCHIATRY COMPLEX, PRIVATE BAG X20607
TEL. 051 407 9294/6/7: FAX 051-447 5370

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9323
12 APRIL 2007

CEO/ACTING CEO
PELONOMI HOSPITAL
BLOEMFONTEIN
9300

Dr/Sir/Me.

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Yours sincerely

Nophale.

MRS. L.E. NOPHALE
Student no: 199934291
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E-mail: gngmlen.md@mail.ufs.ac.za

PELONOMI HOSPITAL
DR. M.G. SCHOON
9 - MAY 2007
Head Clinical Services
DEPARTMENT OF HEALTH

Refer to Dr Pule

0

FREE STATE PROVINCE

Ref. no.: 13/2

24 April 2007

Me L.E Nophale
Provincial Occupational Health Unit
P.O Box 339 (G52) UFS
Faculty of Health Sciences
Block E Ground room 217
Bloemfontein
9323

Dear Me Nophale

RESEARCH PROJECT: NEEDLE PRICK INJURIES AMONGST HEALTH CARE WORKERS OF REGIONAL HOSPITALS IN THE FREE STATE PROVINCE.

Herewith permission for the mentioned project to be done at Universitas Academic Hospital on condition that approval is obtained from the Ethics Committee.

No findings can be published without permission of the Chief Executive Officer.

Yours sincerely

DR NRJ VAN ZYL
2007-05-02

DR NIC R J VAN ZYL
HEAD: CLINICAL SERVICES

HEAD: CLINICAL SERVICES
UNIVERSITAS ACADEMIC HOSPITAL

Department of Health ▼ Departement van Gesondheid ▼ Lefapha La Bophelo Bo Botle

HEAD: CLINICAL SERVICES: **DR N R J VAN ZYL**, UNIVERSITAS TERTIARY HOSPITAL ● Private Bag X20660, Bloemfontein,9300
● Tel. no.: 051-4052866 ● Fax: 051-4440792 ● Room 1129, First Floor, Universitas Tertiary Hospital
● E-mail: vanzylnr@fshealth.gov.za

Annexure D:

Study Questionnaire

QUESTIONNAIRE ON NEEDLE STICK INJURIES (NSI) AMONGST HEALTH CARE WORKERS IN REGIONAL HOSPITALS IN DISTRICTS OF THE FREE STATE PROVINCE

☐☐☐ 1-3

INSTRUCTIONS

You have been asked to participate in a research study. Please note that by completing this questionnaire you are voluntarily agreeing to participate in this researchstudy. You will remain anonymous and your data will be treated confidentilly at all times. You may withdraw from this study at any moment during the completion of the questionnaire.

To be competed by participants in the Regional Hospitals. The questionnaire consist of 3 sections: Section A: Needle Stick Injury; Section B: Practices; Section C: Management

Please complete the questionnaire in full. Mark the appropriate answer with a cross (X) or write in the space provided.

HOSPITAL _____ ☐ 4

SECTION A

Information on Needle Stick Injurie(s) (NSI)

1 What is your gender

- [1] Male
- [2] Female

2 What is your age?

_____ ☐☐ 5-6

3. In which ward/unit/department are you curently working?

- [1] Burns unit
- [2] Casualty Department
- [3] Intensive care unit
- [4] Isolation ward
- [5] Medical ward
- [6] Maternity ward
- [7] Orthopedic ward
- [8] Paediatric ward
- [9] Surgical ward
- [10] Theatre
- [11] Other, please specify _____ ☐☐ 7-8

4. How long have you worked in the ward/unit/department where you got the needle stick injury?

_____ ☐☐ 9-10

5 Are you trained in the type of work that you were performing during the needle stick injury?

- [1] Yes
- [2] No ☐ 11

6. In which category of Health Care Workers (HCW) do you fall?

- [1] Doctor
- [2] Professional Nurse (CPN/SPN/PN)
- [3] Staff Nurse
- [4] Auxilliary Nurse
- [5] General Assistance ☐ 12

7. When last did you receive Hepatitis B immunization?

_____ ☐☐ 13-14

8. Was this your first exposure to a needle stick injury?

- [1] Yes
- [2] No ☐ 15

9. If no, indicate the occurance(s) according to the year

YEAR	OCCURRENCE
	Case 1
	Case 2
	Case 3
	Case 4
	Case 5
	Case 6

16-17
18-19
20-21
22-23
24-25
26-27

10 In case of the last needle stick injury, what time did the injury occur?

1 between 07h00-10h00
2 between 11h00-13h00
3 between 14h00-19h00
4 between 19h00-23h00
5 between 23h00-06h00

28

11. Were you aware of the Needle Stick Injury Policy (NSI) in your institution?

1 Yes
2 No

29

12 If not, provide reason

_____
_____
_____

30-31
32-33
34-35

13. Did you receive the following inservice training regarding needle stick injuries?

Prevention
1 Yes
2 No

36

Management
1 Yes
2 No

37

14 How deep was your needle stick injury?

1 Deep
2 Superficial

38

15 What was the HIV status of the source?

1 HIV positive
2 HIV negative
3 HIV status unknown

39

16 Did you get Pre-test counselling after your exposure to a needle stick injury?

1 Yes
2 No

40

17 If no, explain why not

_____
_____
_____
_____
_____

41-42
43-44
45-46
47-48
49-50

18 Did you get Post-test counselling after your exposure to a needle stick injury?

1 Yes
2 No

51

19 If no, explain why not

_____
_____
_____
_____
_____

52-53
54-55
56-57
58-59
60-61

SECTION B
Information on practices leading to a Needle Stick Injury (NSI)

20. What caused you to get a needle stick injury?

1 Disposing the needle
2 Recapping the needle
3 Manipulating the needle
4 Passing the device to somebody else
5 Waste disposal (cleaning up)
6 Cannulation
7 Collision with other worker
8 Wrong disposal of needle/device

62
63
64
65
66
67
68
69

21 Did you wear prescribed protective clothing?

1 Yes
2 No

70

22. If yes, indicate the type of protective clothing you were wearing

_____
_____
_____

71-72
73-74
75-76

23. If no, explain why not

_____
_____
_____

77-78
79-80
1-2

24 What type of device injured you?

1 Injection needle
2 Stylet
3 Suture needle
4 Venojet needle
5 Other

3
4
5
6
7

25. If other, please specify

_____

8-9

26. How did you discard of the device you got injured with, as indicated in question 22?

_____
_____
_____
_____
_____

☐☐ 10-11
☐☐ 12-13
☐☐ 14-15
☐☐ 16-17
☐☐ 18-19

27 Which type of container did you use to discard the device?

_____

☐ 20

SECTION C
Information on Management of Needle Stick Injuries (NSI)

28. What did you do immediately to the injured area after needle stick injury ?

_____
_____
_____

☐☐ 21-22
☐☐ 23-24
☐☐ 25-26

29 To whom did you report immediately?

_____
_____
_____
_____
_____

☐☐ 27-28
☐☐ 29-30
☐☐ 31-32
☐☐ 33-34
☐☐ 35-36

30. When did you report the injury?

1	Immediately after the needle stick
2	Late before going off duty
3	The following day
4	More than two days post needle stick
5	Other, please specify _____

☐ 37
☐ 38
☐ 39
☐ 40
☐ 41

31. Did you report the needle stick injury to the Occupational Health Nurse?

1	Yes
2	No

☐ 42

32. If you did not report the needle stick injury to any person, indicate why not

_____
_____
_____

☐☐ 43-44
☐☐ 45-46
☐☐ 47-48

33. How long after exposure did you receive post exposure medication?

1	Within 2 hours after needle stick injury
2	Late before going off duty
3	The following day
4	More than two days post needle stick injury
5	Other, please specify _____

☐ 49
☐ 50
☐ 51
☐ 52
☐ 53

34. If not within 2 hours, give reason for delay

_____
_____
_____
_____
_____

☐☐ 54-55
☐☐ 56-57
☐☐ 58-59
☐☐ 60-61
☐☐ 62-63

35. Did you take the post-exposure medication?

1 Yes
2 No

☐ 64

36. If yes, did you complete the medication for 28 days?

1 Yes
2 No

☐ 65

37. If not, why not?

_____
_____
_____

☐☐ 66-67
☐☐ 68-69
☐☐ 70-71

38 Was blood drawn from you after the needle stick injury for testing?

1 Yes
2 No

☐ 72

39 If no, why not?

_____
_____
_____
_____

☐☐ 73-74
☐☐ 75-76
☐☐ 77-78
☐☐ 79-80

40. Did you receive hepatitis B immunization post exposure?

1 Yes
2 No

☐ 1

41 If not, why not?

_____
_____
_____

☐☐ 2-3
☐☐ 4-5
☐☐ 6-7

42 Did you go for follow up post needle stick injury?

1 Yes
2 No

☐ 8

43 If no, why not?

_____
_____
_____

☐☐ 9-10
☐☐ 11-12
☐☐ 13-14

End of the questionnaire. Thanking you kindly for your participation.