Correlates of Needle Stick Injuries among Health Care Workers at St. Pauls Mission Hospital

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Abstract

The aim of the study was to profile the epidemiology and different determinants of needle stick injury among health care workers at St. Pauls Mission Hospital which could be used to develop/foster needle stick infection control measures. A cross sectional quantitative survey-based design was used in this study. A sample of 143 nurses instead was enlisted in this study from an expected sample size. In the last ten years, the incidence of NSIs was 139 episodes with an annual mean occurrence of 11 episodes per year. Within the sample of those who had NSIs, there are more health workers who are proactive and take up preventive actions than those who do not. Infection control measures appear not to be emphasised. There are more than half of respondents who indicated ''No'' than those who indicated ''Yes'' for the infection control prevention strategies. The least adhered to infection control strategy is the non-insistence of wearing of eye goggles when conducting minor or major surgery. The determinants of NSIs were; not wearing gloves before touching anything wet – broken skin, mucous membranes, blood, body fluids, secretion, or excretion or before touching soiled instruments and other items, not using barriers- Personal Protective Equipment (PPE) such as protective goggles, face mask and aprons if splashes or spills of blood or body fluids secretions or excretions are anticipated, lack of training at the workplace, long working hours and lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers. In conclusion, NSIs were observed in all categories of HCWs. There is a scope for improvement in safety protocols. Preventive strategies have to be devised and reporting of NSI need to be made mandatory. Issues requiring attention include use of safety engineered devices (SED), recording and reporting of incidents, training of all HCWs in handling and disposal of sharps, establishing a staff student health service and inculcating a responsible attitude among HCWs. The solutions are easy ones as they do need substantial resources.

Introduction

Needle stick and sharp object injuries (NSIs) are commonly encountered by people handling needles in the medical setting, such injuries are an occupational hazard in the medical community (Frijstein et al., 2002). Needle stick and sharps injuries (NSIs) have been recognized as one of the most serious occupational hazards among health care workers (HCWs) (Gurubacharya et al., 2003; Patterson et al., 2003; Shiao et al., 2002). Needle stick injuries (NSIs) and sharp injuries (SIs) comprise about 12% of all working people worldwide (Hofmann and Beie, 2002). It is estimated that of 35 million HCWs worldwide (Abu-Gad and Al-Turki 2001), 3 million experience these injuries every year (O Connor, 2009). Among HCWs, the highest incidence of these injuries has been reported more among nurses than other health workers (Abu-Gad and Al-Turki 2001; Saleh et al., 2005; Rampal et al., 2010; Gholami et al., 2013; Memish et al., 2013; Jahangiri et al., 2016).

Exposure to blood products in teaching hospitals is a common occurrence. But these incidents are usually under-reported (McCormickand Maki, 1981; McCormick et al., 1991), so NSI and blood exposure injury data are lacking. Moreover, elaborate knowledge, attitude and practice (KAP) studies are also lacking in an NSI contexts. Our study addresses NSI's importance and aims to determining NSI occurrence and awareness among healthcare workers (HCW) regarding their KAP. We explore various measures to prevent these injuries such as improving knowledge, attitude, and practice. We try to integrate organizational changes and recommend specific strategies for consistent and safe methods for dealing with such incidents.

The frequency of NSIs has not been estimated in Zambia as compared to other nations (Cho et al 2013). Several other reports on sharp object injuries among health care workers have emerged from the

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West, Asia mainland (Jahan, 2005; Salleh et al., 2013) and South East Asia (Jahan et al., 2005). Among healthcare workers nurses and physicians appear especially at risk (Memish et al., 2013). It is estimated that annually as a consequence there are 66,000 infections with HBV, 16,000 with HCV, and 1000 with HIV worldwide (WHO, 2002).

As there is a marked underreporting of needle stick incidents acquired by health care workers in Zamia it is not possible to develop interventions because the available evidence shows that the under-reporting rate after a needle stick injury is low. Considering the high prevalence of NSIs and SIs and their important outcomes, researchers have emphasized the importance of reducing these injuries through recognizing the related risk factors (Rampal et al., 2010; Cho et al., 2013). While this is the case, research in Zambia has not looked at risks. To the best of this researcher's knowledge, no study has profiled KAP and different risk factors correlated with needle stick injury among health care workers in Zambia. Given this problem, the aim of the study was to profile the epidemiology and different determinants of needle stick injury among health care workers at St. Pauls Mission Hospital which could be used to develop/foster needle stick infection control measures.

Research design

A quantitative cross-sectional descriptive study design was adopted for this study. This was carried out in rural district setting called Nchelenge in the Luapula Province in Zambia. The hospital has a Health Worker workforce totalling 670. Yamane sampling formula below will be used to determine the sample size. The sampling error will be set at 5% precision.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the level of precision (z score 0.05). All participants were volunteers and signed a written informed consent statement prior to taking part in the study. The total number of staff who were should have been approached for the study who satisfied the inclusion criteria was 169. A sample of 143 nurses instead was enlisted in this study from an expected sample size. The response rate of 85% was high and acceptable.

The researcher drafted a questionnaire on needle stick injuries and was piloted it among 10 nurses within the hospital and the study outcomes were not included in this study. Their comments were used to design the final version of interview schema and the questionnaire.

Before data was collected, ethical approval was received from the Research Ethics Committee of the University of Zambia (See ethical approval letter). Permission to conduct the study was sought from the local Executive Director of the Hospital. All respondents consented before participating in the study.

Staff were briefed on the study by way of a brochure at least one month before the study. Informed consent will be obtained from all of the potential participants. The study employed an anonymous, self-reporting questionnaire structured specifically to obtain quantitative data to identify risk factors and other attributes associated with NSIs. The questionnaire was constructed based on the literature. Questions relating to awareness, attitudes and practices regarding preventive measures will also be included.

Data analysis

The SPSS software version 20 was used for statistical analysis to generate univariate variables which appear as measures of central tendencies and dispersions.

Research findings

The results of this study are from a survey that was conducted from May to June 2019. Just over half of the health worker's n = 86 (60.1%) had worked for over eight years implying that the sample was composed of health care workers (HCWs) with sufficient experience in infection control. Of the 143 HCWs, 64 (44.8%) were males and 79 (55.2%) were females and their mean age was 33.7 ± 7.5 years the oldest was 57 and the youngest was 19 years. As expected, majority of the HCWs who participated in this study were nurses 102 (71.3%), and then Clinical Officers n = 18 (12.6%). The least number

were doctors' n = 3 (2.1%). Tables 1 and 2 show some socio-demographic characteristics of the studied HCWs by gender.

Table 1. Demographic profile

Social demographic Characteristic	f	%
Sex		
Male	64	44.8
Female	79	55.2
Occupation		
Doctors	3	2.1
Nurse	102	71.3
Technicians	11	7.7
Attendants	9	6.3
Clinical officers	18	12.6
Work Station		
Patient room/ward	51	35.7
Treatment/procedure room	14	9.8
Clinical laboratories	16	11.2
Mortuary/pathology	1	.7
Labour and delivery room	16	11.2
Emergency Dept.	2	1.4
Operating theatre/recovery	10	7.0
Outpatient clinic/office	29	20.3
Blood bank	4	2.8

Incidence of NSI and action

From this sample, the incidence of NSI in the last ten years shows that injecting and venepuncture, appear to be problems worth noting (See Table 2).

Table 2. Needle stick injury profile

Source of Needle stick Injury	Frequency			
	Yes		No	
	n	%	n	%
Suturing	12	8.4	131	91.6
Assisting a surgical procedure	8	5.6	135	94.4
Injecting	29	20.3	114	79.7
Passing needle	10	7.0	133	93.0
Recapping needle	12	8.4	131	91.6
Cleaning up	24	16.8	119	83.2
Venepuncture	13	9.1	130	90.9
Recapping a needle	9	6.3	134	93.7
Removing needle	14	9.8	129	90.2
Arterial puncture	0	0	134	100
Throwing needle	8	5.6	135	94.4

In this sample, there were 139 episodes of NSIs in the last ten years – a mean occurrence of 11 per year (See Table 3).

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Table 3. Needle stick incidence profile

Incidence of Needle stick Injury per person	Frequency			
	Yes		No	
	n	%	n	%
Experienced an NSI once	106	74.1	37	25.9
Experienced an NSI three times	3	2.1	140	97.9
Experienced NSI four times	1	0.7	142	99.3
Not experienced NSI	33	23.1	110	76.9

Action taken following needle stick injury

Within the sample of those who had NSIs, there are more health workers who are proactive and take up preventive actions than those who do not (Table 4).

Table 4. Action taken following NSI

Action taken following NSI	Frequency					
	Yes		No		Not applicable	
	n	%	n	%	n	%
I washed the wound	98	68.5	12	8.4	33	2.1
I continued working	99	69.2	11	7.7	33	23.1
I consented to have my blood to be drawn for HIV and HBV test	98	68.5	12	8.4	33	2.1
I reported my needle stick matter to the infection committee	91	63.6	19	133	33	23.1
I got HBV and HIV vaccination/prophylaxis	100	69.9	10	7.0	33	2.1
I took some action as I thought it was infectious	102	71.3	8	5.6	33	23.1
I took action as I deemed the Incidence was important	96	67.1	14	9.8	33	2.1
I took action as I was worried about future consequences	95	66.4	15	10.5	33	23.1
I took action as the reporting process was not complicated to follow	104	72.7	6	4.2	33	2.1
I took action because I did not want to be embarrassed in future	103	72.0	7	4.9	33	23.1
I reported as I did know needle stick injuries were reportable	110	76.9	0	0	33	2.1

Infection control measures

At St Paul's Mission Hospital, infection control measures appear not to be emphasised. There are more than half of respondents who indicated ''No'' than those who indicated ''Yes'' for the infection control prevention strategies. The least adhered to infection control strategy is the non-insistence of wearing of eye goggles when conducting minor or major surgery (See Table 5).

Table 5. Infection control measures

NSI Infection control measures	Frequency			
	Yes		No	
	n	%	n	%
In my work place there is training on infection prevention	49	34.3	94	65.7
In my work place there is insistence of wearing of eye goggles when conducting minor or major surgery	30	21.0	113	79.0
In my work place there is availability of enough hand washing facilities	71	49.7	72	50.3
In my work place there is presence of safety sign	52	36.4	91	63.6
In my work place there is presence of infection prevention committee	57	39.0	86	60.1
In my work place there is there is enough protective equipment against needle stick injuries	66	46.2	77	53.8

Determinants of needle stick injuries

When the health workers were asked to identify what the determinants of NSIs were; I wear gloves before touching anything wet – broken skin, mucous membranes, blood, body fluids, secretion, or excretion or before touching soiled instruments and other items.

1) I use barriers- Personal Protective Equipment (PPE) such as protective goggles, face mask and aprons if splashes or spills of blood or body fluids secretions or excretions are anticipated.
2) I have most of the times used safe work practices, such as bending needles, safely passing sharp instruments, and disposing sharps in a puncture proof container.
3) Lack of training at the workplace contributed to my getting pricked
4) Long working hours at the workplace contributed to my getting pricked
5) I find it inevitable to recap the needle
6) Lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers.

These are shown in Table 6 below.

Table 6. Determinants of needle stick injuries

Determinants	Frequency				
	SA	A	SWA	DA	SDA
*I wear gloves before touching anything wet – broken skin, mucous membranes, blood, body fluids, secretion, or excretion or before touching soiled instruments and other items.	119	24	0	0	0
*I use barriers- Personal Protective Equipment (PPE) such as protective goggles, face mask, and aprons if splashes or spills of blood or body fluids secretions or excretions are anticipated.	94	49	0	0	0
*I have most of the times used safe work practices, such as bending needles, safely passing sharp instruments, and disposing sharps in a puncture proof container.	100	43	0	0	0
*Lack of training at the workplace contributed to my getting pricked	32	42	13	36	20
*Long working hours at the workplace contributed to my getting pricked	39	28	11	45	20
I find it inevitable to recap the needle	48	13	21	31	30
Overuse of injections and unnecessary sharps	0	0	97	9	37

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*Lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers	33	20	43	8	39
Inadequate or shortage of staffing	4	5	11	45	78
Lack of engineering controls such as safer needle devices	9	15	13	40	66
Passing instruments from hand to hand in the operating suite or during treatment or performing a task	10	20	8	57	48

Discussion and conclusion

This cross-sectional study aimed at determining the incidence of needle stick injury cases among HCWs at ST. Pauls Mission Hospital. The present study addressed certain aspects of NSI in a busy rural mission hospital and derived some equivocal and some contrasting results.

In the last ten years, the incidence of NSIs was 139 episodes with an annual mean occurrence of 11 episodes per year. Considerably low proportions of each category of the health workers were susceptible to needle stick injuries though among them nurses were more at risk than all others. Within the sample of those who had NSIs, there are more health workers who are proactive and take up preventive actions than those who do not. Infection control measures appear not to be emphasised. There are more than half of respondents who indicated ‘‘No’’ than those who indicated ''Yes’’ for the infection control prevention strategies. The least adhered to infection control strategy is the non-insistence of wearing of eye goggles when conducting minor or major surgery. The determinants of NSIs were; not wearing gloves before touching anything wet – broken skin, mucous membranes, blood, body fluids, secretion, or excretion or before touching soiled instruments and other items, not using barriers- Personal Protective Equipment (PPE) such as protective goggles, face mask and aprons if splashes or spills of blood or body fluids secretions or excretions are anticipated, lack of training at the workplace, long working hours and lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers. The researcher further has established that most departments do not have formal (separate) HIV post-exposure prophylaxis centres with proper guidelines.

Though the studied health workers who had needle stick injuries had post-exposure prophylaxis, most did not because the patients turned out to be HIV negative. There was however delay in initiating PEP perhaps because PEP was not accessible 24 hours.

These low figures of incidence may not be attributed to patient overload but perhaps a different work culture in the rural scenario. Several studies have shown high occurrence of NSI. The incidence of needle sticks injuries findings of this study (7%) are lower than the results of the study done in sub Saharan Africa (Fredrich et al., 2005) that recorded an incidence rate of 57% in the last the previous year. However, there are other studies where the incidence rate was lower than this study. A survey of British nurses by the Royal College of Nursing in 2006, reported that 9 in 10 nurses use needles or sharps, most report that there are procedures for dealing with sharps/needle stick injuries, and 7% of nurses had been injured by a sharp/needle in the previous12 months (Ball and Pike, 2006).

Published estimates of needle stick injury incidence within the United Kingdom are rather low but vary widely. For example, a Scottish study involving 132,000 survey participants reported an annual incidence of just 1.85 % (Elmiyeh et al., 2004) while a survey involving 279 doctors and nurses at an acute district general hospital in England indicated an annual incidence of 1.8% per HCW. In Germany, as in other countries, the reported annual incidence of needle stick injuries can vary widely; for example, one study found rates of 05.3% per HCW per year based on data in hospital surveillance systems compared with 4.1% based on a survey of HCWs (Elmiyeh et al., 2004).

The annual occurrence of needle stick injuries in France is estimated at 18,720 for nurses, a figure calculated by multiplying the number of nurses at risk (234,000) (IRDES, 2006; Saia et al., 2010) by the incidences reported per year per nurse 8% (Lamontagne et al. (2007). Alternatively, the national network Reseau d’Alerte d’Investigation et de Surveillance des Infections Nosocomiales estimated that 41,276 blood exposures occurred in France in 2004, 72% (29,719) of which were caused by needle stick injuries (Venier et al. 2007). That study also estimated that the annual incidence rates of blood and body fluid exposures via needle stick injuries were 5.8 per 100 hospital beds, 0.05 per full-time equivalent nurse, 0.02 per full-time equivalent physician, and 0.01 per full-time equivalent nurse’s aide.

The Italian Occupational Risk Study on HIV (SIROH) is the main public surveillance program for occupational infections in Italy. The results of a SIROH-EPINet survey that documented 27,000 claims of occupational events in Italian indicated that nurses accounted for the greatest number of occupational exposures to needle stick injuries (57%), followed by auxiliary personnel (18%), training personnel (13%), and physicians (5%) (Puro et al., 2001). Based on data gathered from the SIROH-EPINet survey, the Assobiomedica estimated that, in Italy, 0.061 NIs occur per HCW each year. Given this incidence and the total number of HCWs at risk (463,000), the Ministry of Health estimated an annual occurrence of 28,200 NSIs in Italy. The annual incidence rates reported by SIROH-EPINet28 for needle stick injuries appear broadly consistent with results from a separate report that found an annual incidence of 8.4% for nurses and 2.8% for physicians. The EPINet in Spain reported a mean annual incidence of 11.8% needle stick injuries per 100 occupied beds using data collected from 64 hospitals between 1996 and 2000 (Trim and Elliott, 2003); thus, an alternative estimate suggests that 21,815 needle stick injuries occur in Spain annually.

Although it is generally felt that working in the healthcare sector is clean and without risk, healthcare staff and especially physicians and nurses who generally work very long hours are actually exposed to various occupational risks. Sharps and needle stick injuries are important problems for healthcare workers as they increase the risk of spread of infection. Certain clinical practices such as recapping needles were related more to the likelihood of being injured. This points to inadequate training of HCWs, or their refusal to follow correct procedures. Other studies have also condemned the practice of recapping needles and offered remedial measures (Joseph et al., 1999; Askarian and Malekmakan, 2006; Chacko and Isaac, 2007; Alam, 2002).

This study has shown a large number of health workers who reported that they have never had a needle stick injury been exposed to HIV risk conditions which is higher than the 2003 Italian study that indicated the overall occupational exposure to be 11.3, 11, 4.9, and 4.1%, in midwives, nurses, cleaners, and laboratory technicians, respectively (Bandolier, 2003). This difference might be due to the difference in the settings.

In contrary to this study, previous studies showed that considerable numbers of health workers were exposed to the risk of HIV. The study in Guy's and St Thomas's hospitals revealed 76% of junior doctors had experienced high risk of exposure to potentially infective material at some stage in their careers but only 18% had sought advice about PEP following potential exposures (Chen et al., 2003). This difference might be due to the presence of social desirability bias in the present study or doctors might have used universal precautions better than others. The later explanation also can be applied for the exposure of lesser proportion of the health workers to needle prick/cut by sharps in the current study than the finding documented in the study done in Nepal in 2003 (Gurubacharya et al., 2003). The quantitative and qualitative study revealed similar results on determinants of exposure of health workers to HIV risk conditions in their work place and were also supported by the result of the study done in Johannesburg University (Karstaedt and Pantanowitz, 2001). Regarding delay or desire not to seek PEP seems to be common with most of the studies. Like the Nepal study finding most exposed health workers didn't use PEP (Martin and Makay, 2007). In this study, the major perceived reasons reported for not using PEP of HIV after exposure were almost similar with the findings of the studies done in Australia, Kenya and others that identified the reasons which discourage reporting of the risk of an HIV occupational exposure including being sure of the patient being HIV negative, uncertainty regarding the confidentiality of the results, being unaware that a protocol exists for reporting and dealing with occupational exposure, and lack of support and encouragement to report (Julian and Maggy, 2005; Martin and Makary, 2007).

Working long hours was also a significant predictor of the risk of needle stick injuries, and this study has not shown that it has been previously associated with recapping and poor compliance with precautions (Adegboye et al. 1994; Dejoy et al. 1995; Aiken et al. 1997; Grosch et al. 1999; Gershon et al. 2000), but it has not been linked directly to the occurrence of needle stick injuries. Working excessive hours can result in stress and emotional and physical exhaustion, which are likely to increase the chance of human error and contribute to a tendency towards risky behaviours, such as poor compliance with the precautions in general (Dejoy et al. 1995; Gershon et al. 1995; Aiken et al. 1997; Grosch et al. 1999;

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Gershon et al., 2000). Long working hours is also an indicator of understaffing, a common phenomenon in developing countries (WHO, 2001; Ugandan Ministry of Health, Resource Centre 2003a, b).

Limitations and strengths of this study

Due to the obvious limitation of this study (cross-sectional study), doing further study, which is stronger in determining cause and effect relationship of the variables, is advisable. The study outcomes cannot be generalised to other institutions in Zambia with so much certainty. The questionnaire was answered anonymously, so that the participants could answer with no fear of being linked to their response, and this might have promoted the accuracy of the answers. Because of the voluntary participation into the study some degree of selection bias could not be considered as all those who had got needle stick injuries were eager to participate. The researcher was able to collect information on several potential risk factors and assess their relative contribution to the risk of getting a needle stick injury.

Implications for policy (Recommendations)

The findings indicate that nursing staff are a group should be targeted for educational programmes. Consideration also needs to be given to the unwanted effects of working long shifts, where tiredness may contribute to the number of needle stick injuries.

All health care workers should be able to access timely and competent advice following a needle stick injury, 24 hours a day, and seven days a week. The emotional impact on staff and their family members can never be underestimated and access to effective counselling support – post-incident, while awaiting test results, and for the duration of an anti-viral medication course – is also essential.

In order to have a proper database on these injuries, ST. Pauls Mission Hospital should also develop surveillance systems for needle-stick injuries among HCWs. Legal measures are also indicated to address compensation for HCWs who contact blood-borne pathogens as an occupational hazard. All these would require proper notification, documentation, and education of HCWs. There is also need for: proper training of workers, provision of equipment and clothing for personal protection, establishment of an effective occupational health program that includes PEP and medical surveillance. In ideal situation PEP should be commenced preferably one hour after exposure however up to 2 weeks after exposure one may still start and will still be beneficial. Timely post exposure prophylaxis to high risk body fluids is believed to reduce the risk of sero-conversion to HIV. The staffs showed a lot of reluctance to follow up the system set up for post exposure prophylaxis many once got exposed would either ignore or assume patient is safe or test the patient. This requires more education.

Conclusion

The study has shown that majority of health workers were exposed to needle stick injuries. There is much room for improvement in protecting the HCWs from NSI, which can be accomplished through a combination of comprehensive programmes, including stress on institutional behaviour and device related factors that contribute to the occurrence of these injuries, seeking alternatives to use of needles wherever possible, using newer devices with safety features, ensuring adequate training in safe use and disposal of needles, putting in place a culture of accident reporting, especially sharps-related, and following preventive practices like vaccinations for hepatitis B, as also stressed by several others.

Some institutions elsewhere, have a staff student health service facility in place, which maintains records, and registers the incidence of NSI and has protocols for management and follow-up of NSI cases. This is a dire necessity in all health care facilities even when they have a low rate of NSI.

In conclusion, NSIs were observed in all categories of HCWs. There is a scope for improvement in safety protocols. Preventive strategies have to be devised and reporting of NSI need to be made mandatory. Issues requiring attention include use of safety engineered devices (SED), recording and reporting of incidents, training of all HCWs in handling and disposal of sharps, establishing a staff student health service and inculcating a responsible attitude among HCWs. The solutions are easy ones as they do need substantial resources.

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