Tanzania Journal of Health Research
Volume 19, Number 1, January 2017
Doi: http://dx.doi.org/10.4314/thrb.v19i1.4

Reported incidences and factors associated with percutaneous injuries and splash exposures among healthcare workers in Kahama District, Tanzania

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Abstract
Background: Percutaneous injuries and mucocutaneous blood and other body fluids exposure are among the common hospital hazards affecting health care workers (HCWs) worldwide. These exposures pose risks of contracting infections such as Hepatitis B and C and Human Immunodeficiency viruses. This study aimed to determine the incidence and human factors associated with percutaneous injuries and splash exposures among healthcare workers in Kahama District, Tanzania.
Methods: This descriptive cross sectional study was conducted in Kahama District of north-western Tanzania and involved randomly selected healthcare workers. Structured self-administered questionnaire was used to collect data between July and October 2015.
Results: A total of 277 HCWs participated in the study. Among them 146 (53%) were nurses, 138 (14%) auxiliary staff 36 (13%), 32 (12%) laboratory personnel and 25 (9%) were doctors. The mean age was 37.4 years. Seventy-one percent of the participants had more than 10 years' of working experience. About 59% of participants reported incidences of percutaneous injuries and mucocutaneous blood and other fluids exposures. About 90% of participants agreed to experience the incidences several times. While 60% disagreed with availability of personal protective gears, non-reporting of the cases was noted by 26% of participants. Majority (81%) disagreed with existence of infection prevention and control (IPC) guidelines and protocols. The main human factors associated with the percutaneous injuries and splash exposures included HCWs experience at work (71%), long working hours (29%), type of workplace (48%) and inadequate use of IPC guidelines and protocols (48%).
Conclusion: More than half of participants reported incidents of percutaneous injuries and mucocutaneous blood and other body fluids in Kahama District of Tanzania. Adherence to universal precautions, training and reduction of long working hours are necessary in order to reduce infections from percutaneous injuries and exposures.

Keywords: Percutaneous, mucocutaneous, injuries, incidence, factors, healthcare workers, Tanzania

Introduction

Percutaneous injuries (PI) and mucocutaneous blood and other body fluids exposure (ME) are among the common occupational hazards affecting health care workers (HCWs) worldwide (Shah *et al*., 2003; Tarantola *et al*., 2006). Percutaneous injuries refer to occupation-related unintentional injuries that break the integrity of the skin. The incidences of PI commonly occur during administration of injections, withdrawing blood, recapping needles, disposing of needles and handling trash (Tarantola *et al.* 2006). Mucocutaneous splash exposures occurs when there is contact of the body mucous membrane with blood, other body fluids, tissues, or specimens at the healthcare facility (Amira & Awobusuri, 2014). ME happens during invasive procedures or when handling high risk fluids (CDC, 1992; WHO, 2005). Statistics indicate that 3 million percutaneous injuries occur annually among 35 million healthcare workers globally and over 90% of them happen in resource constrained countries (Prüss-Ustün *et al*., 2005). HCWs in Africa suffer approximately two to four percutaneous injuries per year (Gupta *et al*., 2008). Nigeria, Tanzania and South Africa report about 2 cases of percutaneous injuries per 10 HCWs (WHO, 2005). A study which was conducted at Bugando Medical Centre in north-western Tanzania reported a percutaneous injury prevalence of 48.6% (Chalya *et al*., 2015).

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Percutaneous injury and mucocutaneous splash exposures are a substantial sources of infections with blood borne pathogens among health care workers. Worldwide, occupational exposures accounts for 2.5% of HIV cases and 40% of Hepatitis B and C cases among HCWs (Prüss-Ustün *et al.*, 2005; Gupta *et al*., 2008). In a cross sectional study conducted at two regional hospitals in Pwani and Dodoma regions of Tanzania found that 68.8 % of HCWs are at higher risk of HIV infection and that the estimated risk of HIV transmission due to needle stick injuries is 7 cases per 1,000,000 HCWs-years (Mashoto *et al*., 2013). Infection control measures and adherence to routine standard precautions are known to significantly reduce the risks of HIV and Hepatitis transmission among HCWs (Prüss-Ustün *et al.*, 2005; Gupta *et al.*, 2008; Hanafi *et al*., 2011). However, frequent incidents of PI and ME causes exposed HCWs to experience fear, anxiety and emotional distress (Jahan, 2005) and deter their motivation to comply with universal standard precautions (de la Tribonnière *et al.*, 1998; Worthington *et al*., 2006; Chalya *et al.*, 2016).

Majority of the previous studies attributed institutional and environmental factors to this situation. This study considered human factors associated with PI and ME among HCWs. Human factors include HCW individual factors such as being aware or not on effects of PI and ME, experiences of a HCW on occurrences of the injuries and exposures, its perceived risks and factors surrounding the incidences such as workload and other practice behaviours. Therefore, the objective of this study was to determine the incidence and human factors contributing to percutaneous injury and mucocutaneous splash exposure among healthcare workers in Kahama district health facilities Tanzania.

Materials and Methods

Study design and setting

This descriptive cross-sectional study was conducted in Kahama district and included healthcare works in both private and public health facilities. Kahama district is located in Shinyanga Region, northwest of Tanzania. The district is served by 31 healthcare facilities, of which 12 are public and 19 are private owned.

Study population and sampling

The study population included all health-care workers who came into contact with patients and those who were potentially exposed to blood and other body fluids from patients. They comprised of doctors, clinical officers, nurses, laboratory personnel, mortuary attendants and housekeeping staff. The HCWs whose jobs were not directly related to health care delivery and did not handle patients' specimens were excluded from this study. A sample of size of 277 HCWs was obtained by using Kish's formula (1965) from the study population of 731 (based on district statistics of 2014).

The HCWs were recruited according to their cadres (that is doctors, nurses and others) using a stratified, simple random sampling method. In collaboration with the health facility management a list of staff per cadre was obtained. Each cadre was labelled as stratum. A simple random sampling method was then used to get participants per each stratum proportionally to reach a total of 277 participants.

Data collection

Data was collected using pre-tested structured self-administered questionnaire with questions arranged in 4 parts, A, B and C. and D. In part A, questions related to demographic characteristics of participants were included. In part B issues related healthcare workers on their human factors concerning PI were asked while in part C questions geared to find out information the HCWs reported about blood and body fluids exposures. The questionnaire was in a Likert scale format for parts B and C; where respondents were asked to agree or disagree with several statements related to the study. For part D questions related to risk

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factors for PI and ME such as whether the respondents were aware of ME and about injection practices. This part also included information of infection prevention practices such as whether they used personal protective equipment during invasive procedures. The English version was constructed initially then translated into Kiswahili followed by back to back translation to ensure language proficiency and accuracy. The filled in self-administered questionnaires were reviewed for completeness and consistency by the researchers before they left the field. The questionnaire was coded, edited and data was cleaned.

Data analysis

Data was entered and analysed by SPSS software version 21.0. Measures of central tendency were used to describe the continuous variables. Chi-square test was run to test for significance of associations between the human factors and dependent variables. Significance was set at p-value less than 0.05.

Ethical considerations

Ethical approval was sought from the joint Catholic University of Health and Allied Sciences and Bugando Medical Centre Ethics Review Committee. Permission for the study was obtained from Kahama District Authorities. Written informed consent was asked from participants' prior the study.

Results

Basic characteristics of participants

A total of 277 HCWs consented and participated in this study. Their mean age was 37.4 years (range=20-56 years). More than half (56.3% n=156) were females while at least half (55.2% n=145.), had secondary level of education. More than half (55.6% n= 154) had basic certificates in health related courses with 52.7% (n= 147) of them being nurse midwives. Seventy-five respondents (26.7%) were working in the surgical wards. Majority (70.8%; n=196) of the HCW had less than 10 years' working experience (Table 1).

Table 1: Socio-demographic characteristics of the participants

Variable	Response	Frequency (n)	Percentage
Sex	Male	121	43.7
	Female	156	56.3
Education	College/University	89	32.1
	Secondary	153	55.3
	Primary	35	12.6
Working department	Emergency	7	2.5
	Paediatric Ward	31	11.2
	Maternity ward	54	19.5
	Laboratory	37	13.4
	Theatre	15	5.4
	Medical ward	59	21.3
	Surgical ward	75	26.7
Working experience	<10 years	196	70.8
	>10 years	81	29.2
Professional qualification	Degree	6	2.2
	Advanced Diploma	17	6.1
	Certificate	100	36.1
Cadre	Medical doctor	25	9.0
	Nurse	146	52.7
	Clinical officer	36	13.0
	Laboratory technician	32	11.6
	Medical attendant	38	13.7

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Incidences of percutaneous injuries and mucocutaneous blood exposure

A total of 164 (59.2%) participants reported to experience incidents of PI and ME in the previous one-year prior the study. Among them 34.7% of participants encountered PI incidents while 24.5% of the participants had ME incidents. Those with more than 10 years of working experience reported more occurrences of ME in the previous year than their counterparts less than 10 years of work experience (33.3. % v/s 11. 0 %; p= 0.002). More (48. 4%; p=0.004) HCWs at the paediatric ward reported PIs incidences compared than those from other wards/departments. The HCWs who had 40 or more hours of work reported more incidences (28.9%) of ME than those who worked for less than 40 hours per week (14.9 %) (p= 0.001). Participants who knew the types of PPE available at their departments indicated reported to have experience few incidences of PI and ME in the previous year compared to those who reported not to be aware of available PPE in their departments (21%. *versus* 43.5%; ρ =0.003).

Actions taken by health workers following PI and ME incidents

Majority of the participants reported to wash the site with soap and running water (67.9%) after an incident of PI while 63.8% reported washing the site with soap and running after after an incident of ME (Table 2).

Table 2: Actions taken by healthcare workers after PI or ME incident

Type of injury exposure	Action taken	Number	Percentages
Percutaneous injuries (N = 106)	Washing the site with soap and running water	72	67.9
	Cleaning the site with antiseptic agents	14	13,2
	Squeezing the injured site	12	11.3
	No action taken	8	7.5
Mucocutaneous exposures (N=58)	Washing the site with running water	37	63.8
	Cleaning the site with antiseptic agents	12	20.7
	Washing the site with normal saline	7	12.1
	No action taken	2	3.4

Factors associated with PI and ME

The majority (80.5%) (n= 223) of participants strongly agreed / agreed to handle cases of PIs and ME among other staff while 89.5% (n= 248) were aware of the risks of contracting hepatitis B and C infection. More than half (66.4%) n=184) of the participants had personal protective equipment (PPE)in their departments. About 68.5 %, n=190) of HCWs also strongly agreed/agreed on awareness of staff safety management procedures. Majority (80.5%, n= 223) denied the existence of IPC guidelines and protocols. About 90% (n=249) of participants strongly agreed/agreed to have experienced PI or ME several times in the previous year. Over 28% (n=78) of participants strongly disagreed /disagreed that PI and ME posed risks while 25.9%, (n=72) of them disagreed with the necessity to report PI or ME. incidents. About 33%, (n= 92) did not always use PPE (Table 3).

Reasons for not reporting incidences of PI and ME

Apart from exploring human factors also respondents were asked to mention reasons that contribute to poor reporting of PI and ME incidences in their working areas. As summarized in Table 4, the findings revealed that 60.0% lacked knowledge of the appropriate procedures to follow after an incident (Table 3).

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Table 3: Perceptions of healthcare workers on PI and ME protection issues

Statement on PI/ME protection	Strongly agree/Agree		Strongly disagree/Disagree	
	No.	%	No.	%
Percutaneous injuries occur under the skin caused by sharps	96.8	268	3.2	9
PI and ME are risky for my health	71.8	199	28.2	78
Percutaneous injuries and ME can be prevented	88.1	244	11.9	33
Experience PI and exposures of ME several times in my work	89.8	249	10.2	28
Likely to injure with sharps and expose to splashes of blood/other body fluids when engaged with many patients at a time	33.2	40.1	20.2	6.5
Should report immediately when encountering any PI or ME incident	74.0	205	25.9.	72
Always put personal protective effect at work	66.6	185	33.3	92
PI and ME are more common in labour and mortuary sections /rooms	83.7	232	16.3	45
Ignorance of risks of PI and ME may cause not reporting of the incidence	79.0	219	21.0	58
Adherence to practice prevents the risks to encounter PI and ME	81.2	225	18.8.	52

Table 4: Reasons for not reporting PI and ME incidences among healthcare workers

Reasons for not reporting	Frequency	Percentages (%)
Lack of awareness of the appropriate procedures after injury	90	60.0
Thought the source was not infectious	18	12.0
Not knowing who to report to	12	8.0
Belief that their HBV vaccination status was sufficient	9	6.0
Time constraints	7	4.7
Fear of punitive response by employer	4	2.7
No reason given	10	6.6

Discussion

This study found that majority of HCWs were young adults in their mid-thirties. More than half of the HCWs comprised of nurses as reported by a similar study in a tertiary hospital in north-western Tanzania (Chalya *et al.,* 2016). It has been reported that nurses form the majority of health work force worldwide (Squires *et al*., 2016). The current study also showed that almost three quarters' of HCWs had certificate level of professional education with fewer years of pre-service training. The fact that the certificate cadre basic training is shorter with a maximum of 2 years indicated fewer content areas on infection prevention competences and raised the need for concrete infection prevention trainings at work (Chalya *et al.,* 2016). Over three quarters' of HCWs had more than 10 years of work experience and had experienced IP and ME exposures more than the less experienced staff. Experienced staff are anticipated to trust themselves at work and hence fail to observe new guidelines such as the current universal precautions. Contrary to our finding a study in Malaysia reported that majority of less experienced HCWs frequently encountered occupational injuries and blood exposures (Ng & Hassim, 2007).

About three quarters of the HCWs reported to have experienced several incidences of PI or ME. This finding concur with studies in Ethiopia (Gessessew & Kahsu, 2006; Reda *et al*., 2010), Kenya (Mbaisi *et al.*, 2013), Malaysia (Ng & Hassim, 2007), Nigeria (Olifi *et al*., 2004; Ibekwe *et al*., 2014; Isara *et al*., 2015), Tanzania (Manyele *et al.,* 2004; Chalya *et al*., 2015), Uganda (Nsubuga & Jaakkola, 2005) and United Arab Emirates (Jacob *et al*., 2010). Despite variations in figures reported in these studies

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it indicated that many HCWs were at greater risks of contracting blood-borne infections which necessitates the need for urgent safety and protection measures in resource poor countries.

A larger proportion of HCWs from paediatric department reported incidence of PI and/or ME compared to others. Long working hours are attributed to physical exhaustion and stress and hence increases chances of human errors that contributed to risk behaviours among HCWs. Long hours also indicated shortages of staff which further raised emotional upsets and stress burn-outs. We reported one third of the HCW not to always use PPE in their daily activities that could have resulted from the mentioned reasons. More than half of HCWs had no PPE in their departments. Inadequate availability of PPE has been reported by other studies in East Africa (Nsubuga & Jaakkola, 2005; Chalya *et al*., 2015). In this study, HCWs who were unaware of guidelines at their workplaces reported more occupational exposures compared to those who were aware of the guidelines in their work places.

Low reporting of PI and ME incidences among HCWs found in the current study was attributed by lack of infection prevention guidelines and protocols in the departments coupled with workload constraints. Similarly, the HCWs did not know whom to report to after an incidence of PI or ME. Contrary to our study other reasons for non-reporting by HCWs in a University Hospital Alexandria showed that the doctors and nurses believed that HBV was adequate (Hanafi et al, 2011). Unreported PI and ME posed serious problems and they prevented injured HCWs from receiving post exposure prophylaxis against HIV and other services. Findings indicated that most HCWs understood the recommended actions to be taken following a PI or ME. However, most often clean running water was not available at the health facilities (data not shown). This later observation is an indicator that human factors surrounding PI and ME were indirectly coupled with institutional and organizational factors as reported in some studies (Mbaisi *et al.,* 2013; Chalya *et al.*, 2016).

This study had a number of limitation, including the study design and the used self-administered structured questionnaire. Interpretation and understanding of the questions set in the tool might slightly vary between the participants. The anticipated variation might have effected on participants' responses. Recall bias and exaggerations in responses for perception question might have also affected the results.

In conclusion, the study provided evidence on reported incidences of percutaneous injury and mucocutaneous splash exposure that occurred to healthcare workers in Kahama District of Tanzania. The human factors associated with such occurrences reported in the study meant to guide for the best measures that will ensure healthcare works are protected from contracting blood-borne infections. Since, adherence to infection prevention guidelines is known to be protective against occupational injuries, training on infection prevention strategies, continuous availability of personal protective equipment and measures to ensure reduction of long working hours are mandatory.

Acknowledgements

The authors are grateful to many people who supported the team during this study. Special thanks goes to the Management of Kahama town council Health facilities for permission to conduct this study. We also thank all participants for their time and consent to join this study.

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