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Risk perception and prevalence of blood exposure accidents among health care workers in Murunda hospital in Rwanda

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Abstract
The study aimed at assessing the relationship between risk perception and the prevalence of blood exposure accidents among health care workers in Murunda Hospital in Rwanda. A cross-section study design with quantitative approach was employed, where structured interview using a questionnaire was used to collect data from 80 healthcare workers. Data was analyzed using descriptive statistics where frequencies, percentage, mean and standard deviation were used, followed by binary logistic regression in order to establish the relationship between risk perception of healthcare workers and the prevalence of blood exposure accidents. The findings revealed the prevalence of blood exposure accidents to be 68.8%, and the incidence rate was 2.7 per worker a year. The perception of the severity of consequence of blood exposure accidents was found to be associated to needle stick injuries ($p=0.003$ and $OR=0.292$ at $\alpha=0.05$) and splashes ($p=0.023$ and $OR=0.38$ at $\alpha = 0.05$). It is confirmed that the prevalence of blood exposure accidents was determined by the level of risk perception. The Ministry of Health is therefore recommended to conduct a countrywide trainings aiming at improving perception of healthcare workers with regards to blood exposure accidents and so help them take all precautions intended to prevent blood exposure accidents as it may be the case to all hospitals and healthcare centers.

Keywords: blood, exposure, healthcare, Murunda, risk

Introduction
Blood Exposure Accident (BEA), defined as any contact with blood or a biological liquid containing blood that either enters the skin (prick or cut) or is splashed onto mucous membrane (eye, mouth) or onto broken skin is common among healthcare workers (HCWs) in many countries [1]. It is estimated that healthcare workers incur 3 million needle stick injuries (NSIs) per year accounting to about 8.5% of all healthcare providers. This results in infections with diseases such as hepatitis B (HBV) and C (HCV), HIV and many more. The World Health Organization (WHO) estimates the global burden of disease from occupational exposure to be 40% and 2.5% of hepatitis B and C and HIV infections, respectively, among HCWs as attributable to exposure at work [2].

It is estimated that there are 35 million healthcare workers worldwide accounting for 12% of the working population. The occupational health of this significant group has long been neglected both organizationally and by governments. The misconception exists that the healthcare industry is “clean” and without hazard, when in fact the blood-borne exposures encountered can be career- and life-ending [2]. In US more than 400,000 exposures are suffered by healthcare workers every year and every year 1 out of 10 healthcare workers suffer a splash exposure or a needle stick injury [3]. The exact number of exposures is not known and part of the problem is underreported. It is estimated that approximately 50-67% of all needle sticks and exposures to blood borne pathogens are not reported [4].

The consequences of occupational exposure to pathogens transmitted by biological materials are not only related to infections. Each year, thousands of health workers are affected by psychological traumas that last for days or even months, while they wait for the results of serological examination. Consequences include the side-effects of the prophylactic drugs, anger, depression, fear, anxiety, difficulty with sexual relations, sleeplessness, problems concentrating and doubts regarding their career choice. The emotional effect can be long lasting, even in a low risk exposure that does not result in infection [3].

Avoiding occupational blood exposures is the primary way to prevent transmission of hepatitis B virus hepatitis C virus, and HIV in health-care settings. However, hepatitis B immunization and post exposure management are integral components of a complete program to prevent infection following blood borne pathogen exposure and are important elements of workplace safety [5, 6]. Controls are incorporated into the healthcare work setting to avoid or reduce exposure to potentially infectious materials. Healthcare associated transmission is the transmission of microorganisms that is likely to occur in a healthcare setting that can be reduced by

using engineered controls, safe injection practices, and safe work practices. Engineering controls are equipment, devices, or instruments that remove or isolate a hazard. Safe injection practices are equipment and practices that allow the performance of injections in an optimally safe manner for patients, healthcare providers, and others that reduce exposure [7]. Work practice controls change practices and procedures to reduce or eliminate risk.

In Africa, healthcare workers suffer two to four blood exposure accidents per year on average [2]. Each year as a consequence of occupational exposure, an estimated 66,000 Hepatitis B, 16,000 Hepatitis C and up-to 1,000 HIV infections occur among HCWs. These infections are preventable through infection control measures which significantly reduce the risk of HIV and Hepatitis transmission among health workers. It has been estimated that occupational percutaneous exposure were the major sources of HBV and HCV among healthcare workers representing approximately 45% of HBV and HCV among health care workers. At National hospital of Touba in Senegal 40% of 145 caregivers report to have been exposed to blood in their work. According to the same study, blood exposure accidents were dominated by needle stick injuries which represent 50% of BEA [8].

According to a study done by Akessiwe [9] in referral Hospitals of Lomé and Kara in Togo in 2007, among 540 healthcare workers, 420(77.8%) have been victims of BEA and 114(21,1%) declared their BEA. Zargouni [10] also conducted a study on knowledge attitudes and practices on BEA in the structure of primary healthcare in 2007 for 49 exposed workers in Tunisia where 80 % of respondents had been victims of BEA in their professional lives. A study conducted in Mulago Referral Hospital in Uganda reveals a high incidence of occupational exposures where, mucous membrane 57(47.6%), and needle stick injuries 51(51%) were reported [11].

In Rwanda very little data in relation to BEA is available. Nevertheless, the study by Mukamugema [12] in 2010 on the prevalence of injection practices-related accidents in the general hospital of Gisenyi showed that the prevalence of accidents related to injection practices among healthcare providers was 40%. At Murunda Hospital, like many other hospitals, data related to blood exposure accidents are very limited.

With regard to changing behavior which likely could lead to the occurrence of blood exposure accidents, research show that while knowledge about HIV or other blood borne infections may be adequate; people usually do not feel motivated to modify their behavior unless they sense they are at risk of infection. Hence the central role of perceived susceptibility in behavioral change has been highlighted in recent research [13, 14]. According to the health belief model, this perceived susceptibility in conjunction with perceived severity of infections form risk perception [15]. In other words, the requirement for translating knowledge into behavior change is a feeling of personal risk; that means, feeling the susceptibility and severity of HIV infection and other blood borne infections as these diseases tend to be characterized as diseases of' others' from the earliest reports [16].

While risk perception has been identified as the leading component of behavior change [17] little is known about the perceptions of healthcare workers towards risk of acquiring blood borne diseases and how this perception influences the occurrence of blood exposure accidents. The objective of this study was to assess the relationship between healthcare workers risk perception and the prevalence of blood exposure accidents in Murunda Hospital in Rwanda. Specifically, the study aimed to establish the level of risk perception of healthcare workers, assess the prevalence of blood exposure accidents among healthcare workers, and establish the relationship between risk perception and the prevalence of blood exposure accidents among healthcare workers in Murunda Hospital in Rwanda. The research was limited on blood exposure accidents which occurred from April 2013 to March 2014.

Methodology

Research design, sample size and procedure

The study used quantitative approach with descriptive design to describe the socio-demographic characteristics of respondents and to determine the level of risk perception and the prevalence of blood exposure accidents; while the correlational study design helped to establish the relationship between risk perception and prevalence of blood exposure accidents among healthcare workers in Murunda Hospital in Rwanda. Murunda is a district hospital located in Rutsiro District, Western Province in Rwanda. The district has 323,251 people, 13 sectors, and 18 health centers and one hospital [18]. By the time of the study Murunda Hospital had 80 healthcare workers including nurses, midwives, medical doctors, anesthetists, laboratory technicians and dentists. The study used census whereby all healthcare workers at Murunda Hospital were involved in the study as recommended by Amin [19].

Research instruments and data analysis

Data was collected using a structured interview by use of questionnaire. The questionnaire was designed in English and translated directly into Kinyarwanda during the time of interview when needed. The demographic characteristics, risk perception of healthcare workers, and prevalence of blood exposure accidents were collected. The pre-test of the instrument was done at Kibuye Hospital where twenty voluntarily CHWs were randomly selected; and validity determined using the Content Valid Index (CVI) at 0.68; and reliability of Cronbach's alpha of 0.707 for 18 items. The permission to conduct an interview was sought from the hospital management, thereafter interviews conducted to each healthcare worker at purely voluntary basis. The participants were assured of confidentiality and signed a consent form before responding to the questionnaire. Data was analyzed using descriptive statistics where frequencies, percentage, mean and standard deviation were used. Further, binary logistic regression was run in order to establish the relationship between risk perception of healthcare workers and the prevalence of blood exposure accidents and make inferences.

Results and discussions

Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of respondents

including age, sex, occupation, years of service and experience were considered as seemed to influence the study. Information obtained was analyzed and summarized using frequency and percentage (Table 1). The predominant age group was that of below 35 years (63.8%) and females (52.5%). The study also reveals that the nurses and midwives were the majority (75.1%) thus dominating the study; and maternity services (25%), followed by internal medicine (16.3%). Further, the study reveals that the respondents with 3 or less years of experience (57.6%) were the majority as opposed to 42.5% of those whose experience go beyond 3 years.

Table 1: Socio-demographic characteristics of respondents

Characteristics	Description	Freq.	%age
Age	20-25 years	17	21,3
	26-30 years	20	25,0
	31-35 years	14	17,5
	36-40 years	12	15,0
	41-45 years	17	21,3
Gender	Male	38	47,5
	Female	42	52,5
Occupation	Nurse	45	56,3
	Midwife	15	18,8
	Medical doctor	6	7,5
	Dentist	2	2,5
	Lab technician	8	10,0
	Anesthetists	4	5.0
Service	Pediatrics	11	13,8
	Neonatology	8	10,0
	Maternity	20	25,0
	Outpatient Department	2	2,5
	Internal medicine	13	16,3
	Dentistry	2	2,5
	Surgery	8	10,0
	Laboratory	8	10,0
	Emergency	3	3,8
	Theater	5	6,3
Experience	1 year	11	13,8
	2 years	24	30,0
	3 years	11	13,8
	4years	6	7,5
	5 years	14	17,5
	5+ years	14	17,5
n=80			

Level of Risk Perception

Six questions were used to establish the level of risk perception among healthcare workers at Murunda Hospital and the level determined using frequencies and percentages (Table 2).

Table 2: Level of risk perception

Perception	Level	Freq.	%age
Probability of suffering from BEA	No probability	10	12,5
	Low probability	23	28,8
	Moderate probability	27	33,8
	High probability	16	20,0
	Very high probability	4	5,0
Level of severity of consequences of BEA	No severity	4	5,0
	Low level	24	30,0
	Moderate level	27	33,8
	High level	8	10,0
	Very high level	17	21,3
Probability of catching HIV/AIDS	No probability	15	18,8
	Low probability	30	37,5
	Moderate probability	14	17,5
	High probability	11	13,8
	Very high probability	10	12,5

Level of severity of consequences of HIV/AIDS	No severity	4	5,0
	Low level	25	31,3
	Moderate level	16	20,0
	High level	33	41,3
	Very high level	2	2,5
Level of risk associated to recapping used needles	Low risk	20	25,0
	Moderate risk	24	30,0
	High risk	15	18,8
	Very high risk	21	26,3
Level of risk associated with hand to hand	No risk	4	5,0
exchange of sharps	Low risk	37	46,3
	Moderate risk	10	12,5
	High risk	16	20,0
	Very high risk	13	16,3

n=80

Whereas only 20(24.9%) of HCWs believe there is a high possibility of suffering from blood exposure accidents, 60(75.1%) think that there is moderate, low or no risk at all. This means that respondents have low perception with regards to the probability of occurrence of BEA. These results differ greatly from the findings of Lulie and Emebet [20] who did a study on factors associated with needle stick and sharp injuries, among healthcare workers in Felege Hiwot Referral Hospital in Northwest Ethiopia, where 297(89.5%) of the respondents were concerned about the health risks of needle stick and sharp object injury.

It is important to note that, people who think consequences resulting from blood exposure accidents are fifty-fifty may not take serious precaution measures. In that case, 55(68.8%) perceive moderately to no severe consequences of blood exposure accidents. This low perception on the consequences of blood exposure accidents is supported by Ismail [21] whose study on incidence of needle stick injuries and associated factors among healthcare workers records that the mean score of perception of consequences of needles stick injuries is low compared to the score of knowledge. Gihembo [11] also reports low perception of 51% in this regard. However, these results disagree those of Lulie and Emebet [20] as mentioned earlier in this study.

It is also surprising that 59(73.8%) of respondents barely perceive that there is a high possibility of catching HIV/AIDS when exposed to blood accidents. More seriously, 15(18.8%) have completely low perception which makes the matter worse. The same results were found by Nunn, *et al.*, [22] whereby people in the African American community were reported to underestimate the probability of catching HIV/AIDS among the HIV/AIDS care workers, and consider it the disease of others. Similar results were reported by Frankson [23] in his study ″Knowledge and practice of occupational infection control procedures among healthcare workers in Jamaica″, whereby only 22.5% of respondents correctly estimated the risk of transmission of infection after a NSI from a patient.

The study further reveals that 45(56.3%) of the respondents perceive the level of severity of consequences of HIV/AIDS to be moderate to no risk. This means respondents perceive fairly of consequences of HIV/AIDS. However, such picture still calls for more sensitization among healthcare workers, though there is a greater perception among respondents in this study as compared to those in Jamaica [23].

44(55%) of respondents think that the practices of recapping used needles has moderate to low risk. In this case there in none who does not believe that there is a risk involved. These results are close to what Gihembo [11] reported at Mulago referral hospital in Uganda whereby 68% believe recapping to pose more needle stick injury, even though 59% still recapped needles. In a similar study, Adamo [24] reports a very high risk-perception amongst HCWs regarding occupational practices leading to the occurrence of blood exposure accidents but a poor compliance with universal precautions in their professional duties. In his study, HCWs perception of risk and workplace safety climate did not influence their compliance with universal precautions.

As for hand to hand exchange of sharps, the study shows that most of the respondents 51(63.8%) think this practice has moderate to no risk. This means respondents have low perception with regards to hand to hand exchange of sharps. These results do not agree with that of Adamo [24] where a very high risk-perception amongst HCWs regarding occupational practices leading to the occurrence of blood exposure accidents but a poor compliance with universal precautions in their professional duties was reported in Nigeria.

Prevalence of Blood Exposure Accidents

To assess the prevalence of blood exposure accidents, respondents were asked whether they suffered from the incidents in the last 12 months, the type of blood exposure accident and how many times as presented in table 3.

Table 3: Prevalence of blood exposure accidents

Type of BEA	Exposure	Freq.	%age	Sum of BEA
Suffered from BEA	Yes	55	68,8	
	No	25	32,2	
Needle stick injuries	1	19	22,9	19
	2	19	22,9	38
	3	6	7,2	18
	4	2	0,02	8
Subtotal (NSI)				83(38.2%)
Cuts	1	13	16,3	13
	2	2	2,5	4
	3	3	3,8	9
Subtotal (Cuts)				26(11.9%)
Splashes	1	17	21,3	17
	2	10	12,5	20
	3	5	6,3	15
	4	5	6,3	20
	5	6	7,5	30
	6	1	1,3	6
Subtotal (Splashes)				108(50.4%)
Total of BEA				217
Incidence rate (BEA/n)				2.7

n=80

The study reveals that the prevalence of blood exposure accidents is 68.8% indicating that a great number of healthcare workers in Murunda Hospital have been victims of BEA. Furthermore, these accidents occur at the rate of 2.7BEA/HCW/year. This prevalence is higher compared to 40% reported by Mukamugema [12] in Gisenyi Hospital; 24.9% and 39.4% reported by Lee and Hassim [25] and Hofranipour [26] in Iran, respectively. However, the prevalence in this study is lower comparing to 74%, 77% and 80% reported by Maqbool [27] in an Armed Forces Hospital in Saudi Arabia, Akessiwe [9] in referral Hospitals of Lomé and Kara, and Zargouni [10] in Tunis, respectively.

As observed in table 3, incidences involving splashes affect more healthcare workers 108(50.4%), followed by needle stitch injuries 83(38.2%) and cut injuries 26(11.9%). This finding relates the one reported by Peng, *et al.* [28] on sharp injuries and body fluid exposures among healthcare workers in an Australian tertiary care hospital where 68% were for body fluid exposures and 47% for sharp objects-related injuries. In contrast, in a similar study at the National Hospital of Touba in Senegal, Bouvet [8] found out that blood exposure accidents were dominated by needle stick injuries representing 50% of total BEA cases investigated.

Relationship between risk perception and prevalence of BEA

The relationship between risk perception and the prevalence of blood exposure accidents was determined through binary logistic analysis as recorded in tables 4-6.

Table 4: Relationship between risk perception and needle stick injuries

Perceptions Levels	Needle stick injuries (NSI)			
	Low N (%)	High N (%)	p	OR
Probability of suffering from BEA			,196	1,647
Low	3(30)	7(70)		
High	31(44,3)	39(55.7)		
Severity of consequences of BEA			,003	,292
Low	0(0)	4(100)		
High	34(44,)	42(55,)		
Probability of catching HIV/AIDS			,864	1,060
Low	2(13,3)	13(86,7)		
High	32(49,2)	33(50,8)		
Severity of consequences of HIV/AIDS			,288	,709
Low	3(75)	1(25)		
High	31(40,8)	45(59,2)		
Risk associated with recapping used needles			,967	1,018
Low	10(23,3)	33(76,7)		
High	24(64,9)	13(35,1)		
Risk associated with hand to hand exchange of sharps			,303	,678
Low	0(0)	4(100)		
High	34(44,7)	42(55,3)		

p=p-value, ɑ=0.05; OR=Odd Ratio

The perception of the level of severity of consequences of blood exposure accidents (Table 4) was significantly associated with needle stick injuries (p=0.003 and OR=0.292 at ɑ=0.05). This means that when the perception improves, needle stick injuries decrease, and therefore, people with high perception about the severity of consequences of blood exposure accidents are 0.292 times less likely to experience needle stick injuries. These findings agree with a conclusion by Amoran [29] that, risk perception is significantly associated with the occurrence of needle stick injuries. This is because perception influences attitudes and attitudes influence behavior [2]. Therefore, when one has a high perception of the risk of a blood exposure accident will tend to be more careful in providing healthcare thus reducing the occurrence of incidents. Lavra [30] also emphasizes that the perception of being at risk of infection is the main necessary condition for behavioral change.

Table 5: Relationship between risk perception and cuts

Perception Levels	Cuts			
	Low N (%)	High N (%)	p	OR
Probability of suffering from BEA			,276	,679
Low	9(90)	1(10)		
High	53(75)	17(25)		
Severity of consequences of BEA			,407	1,382
Low	3(75)	1(25)		
High	59(77,6)	17(22,)		
Probability of catching HIV/AIDS			,653	,847
Low	12(80)	3(20)		
High	50(76,9)	15(23,1)		
Severity of consequences of HIV/AIDS			,584	1,180
Low	2(50)	2(50)		
High	60(78,9)	16(21,1)		
Risk associated with recapping used needles			,912	1,049
Low	33(76,7)	10(23,3)		
High	29(78,4)	8(21,6)		
Risk associated with hand to hand exchange of sharps			,213	,639
Low	4(100)	0(0)		
High	58(76,3)	18(23,7)		

p=p-value, ɑ=0.05; OR=Odd Ratio

Unlike needle stich injuries, the finding shows that risk perception is not significantly associated with cuts (Table 5). This does not agree with the results of Amoran [29], Lavra [30] and the concept of health belief model [15] who suggest a clear association of the two. This may be due the low proportion reported for cuts (11.9%) as compared to needle stick injuries (38.2%) and splashes (50.4%).

Table 6: Relationship between risk perception and splashes

Perception Levels	Splashes			
	Low N (%)	High N (%)	p	OR
Probability of suffering from BEA			,384	1,421
Low	2(20)	8(80)		
High	34(48,6)	36(51,)		
Severity of consequences of BEA			,023*	,380
Low	0(0)	4(100)		
High	36(47,4)	40(52,6)		
Probability of catching HIV/AIDS			1,000	1,000
Low	2(13,3)	13(86,7)		
High	34(52,3)	31(47,7)		
Severity of consequences of HIV/AIDS			,141	,615
Low	1(25)	3(75)		
High	35(46,1)	41(53,9)		
Risk associated with recapping used needles			,430	1,415
Low	14(32,6)	29(67,4)		
High	22(59,5)	15(40,5)		
Risk associated with hand to hand exchange of sharps			,439	1,367
Low	0(0)	4(100)		
High	36(47,4)	40(52,6)		
p=p-value, ɑ=0.05; OR=Odd Ratio				

On the other hand, the perception of the level of severity of consequences of blood exposure accidents (Table 6) was found to be significantly associated with splashes (p=0.023, OR=0.38 at ɑ=0.05). It means that when the perception increases, both needle stick injuries and splashes decrease. In that case, HCWs with high perception on the consequences of blood exposure accidents are 0.38 and 0.276 times less likely to suffer from needle stick injuries and experience splashes, respectively. According to the Health Belief Model [15], perceived vulnerability or susceptibility to disease and disease severity combine to form 'threat or risk', and that threat perception motivates action.

Conclusion and recommendations

It is concluded that the level of risk perception about blood exposure accidents among healthcare workers was low but the prevalence and incidence of blood exposure accidents were high. In addition, perception of the severity of consequences of BEA is among the most influential factor that contribute to the prevalence of blood exposure accidents. It is therefore

recommended that the Ministry of Health in Rwanda should conduct national wide seminars and workshops to raise awareness of healthcare workers with regards to blood exposure accidents as it may not be a case of Murunda Hospital alone. Healthcare workers should be trained to protect themselves for all health care provision. Finally, further research should be conducted to fully describe blood exposure accidents and assess other factors influencing blood exposure accidents in order to fight off this hidden epidemic.

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