ORIGINAL ARTICLE

NEEDLESTICK INJURY: A REVIEW OF TWELVE THESES AMONG HEALTHCARE PERSONNEL IN MALAYSIA

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ABSTRACT

Aims	:	The review was to determine the prevalence of needlestick injury especially among health care personnel and to determine the score of knowledge and compliance to the Standard Universal Precaution.
Method	:	Twelve theses were reviewed from year 1996 to 2007 of Master in Community Health Science, Master in Community Health and Postgraduate Diploma in Occupational Health of Community Health Department Universiti Kebangsaan Malaysia Medical Center involving of 1645 respondents of health care personnel, support staff and student of nursing and medical. Eleven studies were cross sectional design and only one study was retrospective.
Results	:	Respondents were dominated by female (74.6%) and Malay ethnicity (65%), as young as 19 years old to 56 years old of age. Majority had received Hepatitis B vaccination (79.4%) but only 37.1% had completed the 3 doses regime. The incidence of episodes of needle stick injury among health care personnel was double (53.7%) compared to final year medical students (20.9%). Needle stick injuries did not occur at random as there were a few health care personnel injured repeatedly. Those who had higher mean or median score for compliance to Standard Universal Precaution were non case of needlestick injury. Work practices had been highlighted in few studies of being risk factors for needlestick injury such as blood withdrawing related activities. Other risk factors were job category, predictive factor for compliance to Standard Universal Precaution, risk perception and training.
Conclusion	:	Even though the review could not extrapolated to general population of healthcare personnel but it gave some illustrated pictures to what had happened in small clustered locations. Episodes of needle stick injury was 53.7% for past 12 years, it was double in comparison to final year medical students in year 2001. 13.2% were injured repeatedly. The score of knowledge was more the 50% of range but compliance to Standard Precaution made differences in being cases or non cases among respondents. The seroconversion status till date was unknown.
Keywords	:	Needlestick injury

INTRODUCTION

In Malaysia, health care personnel (HCP) such as Doctors, Dentist, Nurses, Midwives and Medical Assistants comprises of 96,906 personnel in year 2006[1]. They took care of 1,905,089 patients in that year in which 36.41% of them were hospitalized due to normal deliveries (14.91%), complication of pregnancy, childbirth and puerperium (12.39%) and accidents (9.11%)[1]. HCP exposed to needles and sharp objects during their normal work activities and that could lead to needle stick injury e.g. hypodermic needles, blood collection needles, suture needles and needles used in IV delivery systems. Moreover, their nature of jobs involve with human blood, blood product and tissues either from living or dead, no doubt, they are at risk for occupational exposure to bloodborne pathogens particularly hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). These particular eerie diseases are being a centre point of relevant agencies since early 20th century because it is incurable, fatal infections but preventable with comprehensive knowledge and practical strategies. The incidence rate of HIV infection was 21.88 per 100,000 populations, which was the fourth highest incidence rate of communicable disease preceded by Dengue Fever, Tuberculosis and food poisoning. Following that, the viral Hepatitis was the seventh highest incidence rate that was 9.37 per 100,000 populations[1].

The risk of getting hepatitis B infection from a single needle stick or cut exposure to HBV-infected blood ranges from 6-30% and depends on the hepatitis B e antigen (Hbe Ag) status of source individual, the average risks for an infection after a needle stick or cut exposure to HCV-infected blood and HIV-infected blood is approximately 1.8% and 0.3% respectively[2]. The risk of getting an HIV infection is the smallest risk in comparison to Hepatitis C and Hepatitis B but the risk is hard to ignore especially among healthcare personnel as all sorts of needles are day-to-days-toys to them. This paper to review previous theses which were done by students of Postgraduate Diploma in Occupational Health, Master in Community Health and Master in Community Health Science from year 1996 to 2007 of Community Health Department Universiti Kebangsaan Malaysia to see patterns in prevalence of needle stick injury, risk perception and universal precaution practices.

Phenomenon in Malaysia is worrying as a fact that 5.24% of healthy volunteers, with mean age of 34 years, were positive for HBsAg in 1997[3]. A retrospective study was conducted in year 2000-2004 in north Malaysia revealed that 1.8% of 21,388 first time blood donors were infected with hepatitis B virus[4]. As of December 2007, there were 80,938 HIV cases and 13,635 AIDS cases[5]. Surprisingly, despite those figures, zero HIV/AIDS case reported secondary to needle prick injury in comparison to CDC as of December 2001, it had received reports of 57 documented cases and 138 possible cases occupationally acquired HIV infection among healthcare personnel in the United States since reporting began in 1985[2]. This data is somewhat a relieve but does the data is truly reflective? No one can be sure as sharp injuries recorded through standard occupational reporting systems may underestimate the true injury rate, as much as 10-fold[6] which gives rise probability of hidden case occupationally exposed of Hepatitis B or HIV. A study done at Occupational Health Unit in Sabah showed that there was an increase case of needle stick injury from 38 cases in year 1999 to 47 cases in year 2000[7]. It was probably due to increase awareness of imposed hazards and the importance of reporting for early intervention. That was why the pattern of prevalence of needle stick injury made little change in percentage over the years.

MATERIAL AND METHODS

This was a review of theses of Master in Community Health Science, Master in Community Health and Postgraduate Diploma in Occupational Health from year 1996 to year 2007 of Community Health Department Universiti Kebangsaan Malaysia. It had covered the topics regarding needle stick injury in general. The review involved twelve theses of 1645 respondents including health care workers, health care support staff and students of medical and nursing. However the focus of interest in this study was to report the prevalence of needle stick injury and related factors among health care workers only. Only one study was retrospective cohort whereby all reported needle stick injuries for the previous 3 years had been reviewed and questionnaire had been given to the related staff. Other studies were cross sectional design. Most of the theses had looked into the prevalence on needle stick injury, level of knowledge of blood borne disease/standard precaution, level of risk perception and practice universal precaution by

self administered questionnaire with scoring method. However, the questionnaires differed from one study to another depending on researchers with various scale of scoring and different method and criterion so it was difficult to merge mean score of knowledge, risk perception and Standard Universal Precautions practice.

In this study, needle stick injury was defined as injury caused by hollow bore needles. Data of non-hollow bore needles were not taken. Cases of needle stick injury were the number of respondents who have had at least one experience of needle stick injury. The episodes of needle stick injury were the number of injuries that were experienced by the respondents. The incidence of cases was the number of cases per number of respondent. The incidence of episodes was the number of episodes per number of respondents.

RESULTS

Table 1 shows that majority of respondents were Malays and predominance by female in gender (74.6%). The age was as young as 19 years old up to 56 years old. The mean of age were varies depends on location of studies were done. The studies covered job title of doctors, medical assistant, nurses, medical students and others (housekeeping personal, laboratory technicians, drivers and attendants) in a small percentage. Majority had received Hepatitis B vaccination (79.4%) but only 37.1% had completed the 3 doses regime. Incidence of exposure to needlestick injury, other sharp objects, mucocutaneous exposure and contact through non intact skin were varies in percentage however it was noted that exposure to needle stick injury was commonly in higher percentage in comparison to other type of exposures.

Table 2   Cases and Episodes of Needle Stick Injury

	Cases of needle stick injury (%)	Number of Respondents for Respective Episode (%)		Episodes of needle stick injury (%)
		First episode	≥ 2 episodes	
Study				
Edwin 2002[8] (n=108)	100 (92.6)	73 (67.6)	32 (29.6)	146 (135.2)
Mary 1999[9] (n=62)	11 (17.7)	-	-	-
Lee Lai Kah[10] 2003 (n=285)	48 (16.8)	22 (7.7)	13 (4.6)	149 (52.3)
Ismail 2004[11] (n=63)	9 (14.3)	-	-	-
Ng Yi Wen 2004[12] (n=136)	43 (31.6)	22 (16.2)	16 (11.8)	72 (52.9)
Tang Kiat Beng 2005[13] (n=77)	17 (22.1)	7 (9.1)	8 (10.4)	31 (40.3)
Victor 2005[14] (n=95)	19 (20.0)	5 (5.3)	14 (14.7)	55 (57.9)
Nirmala 2006[15] (n=79)	7 (8.9)	-	-	-
Paream 2007[16] (n=216)	29 (13.4)	22 (10.2)	4 (1.9)	39 (18.1)
Tan Siew Khoon 2007[17] (n=153)	26 (17.0)	-	-	-
Azmi 1997[18] (n=150)	46 (51.1)	-	-	-
Total	355 (24.9)	151 (16.5)	121 (13.2)	492 (53.7)

Table 2 showed that 151 respondents were the first timer of needle stick injury and 121 respondents experienced more than once, one respondent experienced up to 13th times of needle stick injury[8]. Based on available data, 492 episodes of needle stick injury had occurred from year 1997 to 2007 for 355 cases of needle stick injury.

Table 3   Score of Knowledge and Compliance to Standard Precautions

		Score for knowledge on Standard Universal Precaution	Score for compliance to Standard Universal Precautions
Mary 1999[9] (n=62)	Male		Mean= 16.38±1.06
	Female		Mean= 15.13±3.79
Lee Lai Kah 2003[10] (n= 285)	Cases	Med = 8 (range: 4-12)	Med = 34 (range: 23-40)
	Non cases	Med = 8 (range: 4-12)	Med = 35 (range: 23-40)
Ng Yi Wen 2004[12] (n=136)	HCP	Mean=9.15±1.45 (range: 4-12)	
Tan Kiat Beng 2005[13] (n=77)	Doctors	Mean= 8.65±1.27 (range: 7-11)	Mean= 14.48±3.19 (range: 9-23)
Victor 2005[14] (n = 94)	HCP	Mean= 8.4±1.9 (range: 3-12)	
Nirmala 2006[15] (n= 79)	Cases	Mean= 15.0±3.2	
	Non cases	Mean = 20.0±3.2	
Paream 2007[16] (n=216)	Cases	Med = 91 (range: 83-100)	Med=77 (range: 66-100)
	Non cases	Med = 91 (range: 83-100)	Med=88 (range: 66-100)
Tan Siew Khoon 2007[17] (n=153)	Nursing	Mean = 9.90±2.31 (range: 1-12)	Mean= 35.68±3.16 (range: 0-40)
	Non nursing	Mean= 9.47±2.36 (range: 1-12)	Mean = 36.00±2.93 (range: 0-40)
	Trained Nurse	Mean= 10.67±1.78	Mean = 36.70±3.33
	Not trained nurse	Mean= 9.10±2.54	Mean= 34.56±2.18

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Azmi 1997[18] (n=150)	Respondent	Mean = 75.50±10.30 (range: 36.3-92.5)	Mean = 10.05±5.05 (range: 0-18)
	Education Level: Primary(n=22) Secondary(n=111) University(n=17)	Mean= 69.77±13.39 Mean= 76.61±9.49 Mean= 75.47±10.27 (Anova F=4.251, p=0.016)	Mean= 9.63±4.53 Mean= 11.53±4.89 Mean= 7.47±4.23 (Anova F=9.988, p<0.0005)
Hasnah 1996[19] (n=222)	Respondents		Mean= 77.94±12.22 (range:54.2-100)

Table 3 showed that knowledge on Standard Precaution did not make any difference among cases and non cases as scoring marks between the two groups was similar but compliance to Standard Precaution have some effect of being non cases and cases[10, 16]. Non cases of needle stick injury had higher score for compliance to Standard Universal Precautions.

Being educated did make a difference in knowledge scoring but they became less compliance in practice of knowledge[18]. Male[9], secondary education level[18], non doctors[9], trained personnel[17] and non nursing[17] had higher score for compliance to Standard Universal Precautions.

Table 4   Associated Risk Factors for Needle Stick Injury

Source	Risk Factors
Mary 1999[9] (n=62)	Gender: males had higher score of knowledge and practice of Universal Precautions in comparison to females (statistically significant difference)
Lee Lai Kah 2003[10] (n=285)	Being house officers > medical officers > medical students > nurses Lower score of knowledge and practice of universal precaution
Ng Yi Wen 2004[12] (n=136)	Job category: medical assistant > staff nurse > doctor > attendant Lower score risk perception Newly employed Work practices: blood taking related activities (30%) i.e. needle recapping, cap removal, needle disposal into bin, needle insertion into vein, transferring blood sample into tube and detaching needle from syringe; other procedures were iv drip systems (10.9%), parenteral injection (10%) and assisting surgery (6.4%)
Tan Beng Kiat 2005[13] (n=77)	Doctors Work practices: parenteral injection and needle recapping
Victor 2005[14] (n = 94)	Doctor > medical assistant > staff nurse > assistant nurse Work practices: venipuncture (recapping, removal of needle cap, transferring blood into tube, detaching needles from syringes and insertion of needle into vein), parenteral injection, wound suturing and iv drips setting.
Nirmala 2006[15] (n=79)	Lower knowledge of Universal Precaution Work practices : removing needle cap, transferring blood into tube, needle recapping, removal of needle from syringe and disposing needle into sharp bin Exposure to blood borne diseases
Tan Siew Khoon 2007[17] (n=153)	Non trained personnel
Azmi 1997[18] (n=150)	Level of compliance to Universal Precaution. The predictive factors for compliance were level of knowledge, gender, previous training and occupations

DISCUSSION

Being health care personnel is susceptible to multiple occupational safety and health issues. Needle stick injury is one of them. Needle and other sharp tools are being bread and butter in taking care of other peoples' health but at the same time it imposed life-threatening hazards to health care personnel secondary to blood borne diseases. The incidence of episodes of needle stick injury among health care personnel was double i.e. 53.7% in comparison to 20.9% among final year medical students[20]. Needle stick injuries did not occur at random as there were a few health care personnel (13.2%) injured repeatedly. This data was lower than a study of health care workers who had incurred a sharps injury, 36% of 50 workers experienced two or more sharps injuries[21]. Regarding the episodes of needle stick injury, there was no significance difference among studied respondents for duration of services, mean working hours/week, score of knowledge blood borne disease, score of knowledge and practice in Universal Precaution and score in risk perception[12]. Since the Hepatitis B vaccination was barely covered close to 100% of studied health care personnel, in addition to non completed status of immunization status of at least 21.2%, knowledge of Standard Precaution and compliance to the stipulated Standard Precaution were crucial as there was some correlation between score of knowledge in Standard Universal Precaution and compliance in practice to Standard Precaution[7]. From the studies, mean or median score for knowledge and practice of Standard Precaution was 50% or more of total mark but compliance to the Standard Universal Precaution gave differences in being cases or non cases of needle stick injury[10, 16] i.e. increase in level of practice of Universal Precaution reduce the incidence of needle stick injuries[20]. Since the scoring method varied and used different criterion, it was difficult to decide on level of compliance thus unable to generalize the finding on general population but the findings was quite similar among final year medical students of three main universities in Malaysia[20]. 65.4% of respondents theoretically complied to Standard Precaution but in reality 214 out of 239 (89.5%) observations showed otherwise[19] which common reason for injury was poor work practices in blood taking activities such as taking off the cap, recapping the needle after used, transferring blood sample into tube, detaching needle from syringes, insertion of needle into vein, disposing needle into bin, parenteral injection, wound suturing and intravenous drip setting. It was similar to a study done by Norsayani and a study done by Santhna et al. It was observed that 25% out of 40 activities with hollow bore needles recapped the needles after used[22]. 59.9% of non compliance activities were no hand washing before and after handling patients and samples; and use of gloves when necessary[19]. It showed that even experienced health care personnel susceptible to the injury due to wrong practice, same as final year medical students. Occupationally acquired HIV in United States from 1981 through December 2002 was 57 cases documented and 139 were possible cases, nurses (42.1%) and laboratory technicians (33.3%) were mostly involved in documented cases[23]. Distribution of 6212 reported percutaneous injuries involving hollow bore needles in hospital workers by associated medical procedure for year 1995-2000, drawing blood from vein (venepuncture) was responsible for 25% of percutaneous injuries followed by injection (22%), other (19%), assess iv line (14%), insert iv line (12%) and unknown (8%)[23]. Risk perception was difficult to report but probably in near the future association of risk perception and compliance to Standard Precaution has to be established. However, in those who had high risk perception of getting infected, had higher in blood exposure compared to those had low risk perception[18].

SUGGESTIONS

The review showed that there was no marked difference in prevalence pattern of needle stick injury over the 12 years. Prevention needle stick injuries in health care setting should be implemented at employers and workers level[22]. Employers of health care personnel should eliminate the use of needles where safe and effective alternative available or implement the use of devices with safety features and evaluate their use to determine effectiveness and acceptability. In addition, employer should incorporate programs involving workers with elements of analyzing the needle stick injury or sharp related injury to see trend, providing effective training in handling needles, provides safe work practice, promoting awareness in work environment, establish procedure for reporting and timely follow up of needle stick injury and sharp injury, finally evaluate the effectiveness and provide feedback. Workers also need to play

an active role to protect themselves and their fellow workers from needle stick injuries. They should avoid needles where safe and effective alternative devices available, avoid poor work practices such as recapping needles, plan for safe handling and disposal before beginning any procedure using needles, report promptly for cases of needle stick injury or sharp injury, tell employer about hazards that they observe in working environment and participate in training for blood borne disease and follow recommended infection prevention practices including hepatitis B vaccination[24].

Before we can implement the above suggestion we need Malaysian healthcare workers database because based on available data 24.9% of respondents were cases of needlestick injury for past 12 years, yet, there was no data publicly available at national level to compare. In United States, there is a system called EPINet (Exposure Prevention Information Network) surveillance system[23], was developed by Dr. Jagger and colleagues of International Healthcare Worker Safety Center in University of Virginia Health System, dedicated to provide healthcare facilities with a standardized system for tracking occupational blood exposure. The system consist of Needlestick and Sharp Object Injury Report, Blood and Body Fluid Exposure Report, software for entering data and analyzing data from forms and post exposure follow up forms. The system is for free and can be sent as an email attachment. Currently, it is used by 1500 hospitals in US and has been adopted by other countries including Canada, Italy, Spain, Japan and UK. The participating EPINet networks send the data annually to the center so it is the largest cumulative database of 84 participating hospitals in US. In long term the system helps health facilities to identify injury that can be prevented with safer devices, share and compare information and successful intervention, evaluate the efficacy of new devices designed, target high risk devices and procedures for intervention, analyze injury frequency by attributes like jobs, devices and procedures and last but not least preparation of report either monthly, quarterly and annually. If similar system is available in Malaysia, it will group us into a team in handling this well known issue effectively, holistic and standardized because the needlestick injury is no longer 'personnel issue' for certain ministry but it is every healthcare personnel issue. Sometime, we can assure that we will not accidently injured ourselves with those needles but how sure we are

our fellow colleague will not injure ourselves along the normal working activities. Incorporation of information technology should be our main target so the centralized collected data is more useful in empowering the healthcare personnel's safety and health.

Since the above data showed that experienced healthcare personnel was the same level as final year medical students, individual differences in attitude towards Standard Universal Precaution or safe work practices regarding handling of sharps tools should be focused in future study. If the differences can be leveled, all the effort of education and instruments to enhance safe workplace will be used in full capacities. Hence, repetition of needle stick injury events can be prevented.

STUDY LIMITATIONS

All the studies could not confirm the association of needlesticks injuries with the available reporting system so the self reporting data of needle stick injury was susceptible to recall bias (under- or overestimated). Seroconversion status of each case also could not be determined as this may give opportunity to reveal the hidden cases. The studies used different set of questionnaires and marking system so comparison of means could not be done.

CONCLUSION

Even though the review could not extrapolated to general population of healthcare personnel but it gave us some illustrated pictures to what had happened in small clustered locations. Episodes of needle stick injury was 53.7% for past 12 years, it was double in comparison to final year medical students in year 2001. 13.2% were injured repeatedly. The score of knowledge was more the 50% of range but compliance to Standard Precaution made differences in being cases or non cases among respondents. The seroconversion status till date was unknown.

ACKNOWLEDGEMENT

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Table 1 Demographic Characteristic of Health Care Personnel

	Edwin 2002[8] n=108	Mary1999[9] n=62	Lee Lai Kah 2003[10] n=285	Ismail 2004[11] n=63	Ng Yi Wen 2004[12] n=136	Tang Kiat Beng 2005[13] n=77	Victor 2005[14] n=94	Nirmala 2006[15] n=79	Pareom 2007[16] n=216	Tan Siew Khoon 2007[17] n= 153	Azmi 1997[18] n=150	Hasnah 1996[19] n=222
Ethnic												
Malay				55 (87.3)	107 (85.6)	39 (50.6)	87 (92.6)	75 (95)	34 (15.7)	87 (56.9)	111 (74)	166 (74.8)
Chinese				3 (4.8)	31 (40.3)		2 (2.1)	2 (2.5)	8 (3.7)	13 (8.5)	8 (5.3)	13 (5.9)
Indian				5 (7.9)	7 (5.6)	6 (7.8)	5 (5.3)	1 (1.3)	2 (0.9)	53 (34.6)	20 (19.3)	39 (17.6)
Others					10 (8.0) 1 (0.8)	1 (1.3)		1 (1.3)	172 (79.6)		2 (1.3)	4 (1.8)
Sex												
Male		8 (22.9)	48 (16.8)	63 (100)	52 (38.2)	13 (16.9)	8 (8.5)	30 (38)	4 (1.9)	28 (18.3)	47 (31.3)	90 (40.5)
Female		54 (87.1)	237 (83.2)		84 (61.8)	64 (83.1)	86 (91.5)	49 (62)	212 (98.1)	125 (81.7)	103 (68.7)	132 (59.5)
Age (years)												
Mean age		40.4±6.6	31.8±8.9	35.2		31.8				31.42	33.28±8.65	
Range		27 - 51	21 - 54	22 - 56			23 - 56			19-55	19 – 54	
Job Title												
Doctor			50 (17.5)		22 (16.1)	23 (29.9)	11 (11.7)				17 (11.3)	5 (2.3)
Dentists												
Medical Assistant		8 (12.9)		63	18 (13.2)		7 (7.4)				22 (14.7)	8 (3.6)
Nurses	72 (66.7)	54 (87.1)	150 (52.6)		73 (53.7)		73 (77.7)		216 (100)	93 (60.8)	71 (47.3)	58 (26.1)
Others	36 (33.3)				23 (16.9)		3 (3.2)			60 (39.2)	40 (26.7)	74 (33.3)
Medical students			85 (29.8)									
Non Doctors						54 (70.1)						77 (34.7)
Hepatitis B vaccination												
Yes	67 (62)	43 (69.4)	256 (89.8)	45 (71.4)	120 (88.2)	52 (67.5)	78 (83)	66 (83.5)			110 (73.3)	
No	26 (24.1)	17 (27.4)	29 (10.2)	18 (28.6)		25 (32.5)	16 (17)	13 (16.5)			40 (26,7)	
Not stated / unknown	15 (13.9)	2 (3.2)			16 (11.8)							
Immunization status												
Complete (3 doses)			152 (53.3)	17 (37.8)	79 (65.8)	41 (78.8)	62 (66)					
Not complete			133 (46.7)	28 (62.2)	41 (34.2)	11 (21.2)	32 (34)					
Incidence of exposure												
NSI	108(100)	11 (17.7)	67 (23.5)	61 (96.8)	43 (31.6)		30 (31.9)	7 (8.9)	29 (13.4)		46 (51.1)	
Other sharp objects			19 (6.7)	21 (33.3)	11 (8.1)		16 (17)	21 (26.6)	16 (7.4)			
Mucocutaneous exposure		6 (9.7)	52 (18.2)	8 (12.7)	19 (14.0)		4 (4.3)	36 (45.6)	44 (20.4)		85 (56.7)	
Contact through non intact skin		21 (33.9)	22 (7.7)	15 (23.8)	24 (17.6)		5 (5.3)	31 (39.2)	63 (29.2)			