

# Needlestick Injury Among Medical Personnel in Accident and Emergency Department of Two Teaching Hospitals

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## SUMMARY

Needlestick injury has been recognized as one of the occupational hazards which results in transmission of blood-borne pathogens. A cross-sectional study was carried out among 136 health care workers in the Accident and Emergency Department of two teaching hospitals from August to November 2003 to determine the prevalence of cases and episodes of needlestick injury. In addition, this study also assessed the level of knowledge of blood-borne diseases and Universal Precautions, risk perception on the practice of Universal Precautions and to find out factors contributing to needlestick injury. Prevalence of needlestick injury among the health care workers in the two hospitals were found to be 31.6% (N=43) and 52.9% (N=87) respectively. Among different job categories, medical assistants appeared to face the highest risk of needlestick injury. Factors associated with needlestick injury included shorter tenure in one's job ( $p < 0.05$ ). Findings of this study support the hypothesis that health care workers are at risk of needlestick injury while performing procedures on patients. Therefore, comprehensive infection control strategies should be applied to effectively reduce the risk of needlestick injury.

## KEY WORDS:

*Needlestick injury, Health care workers, Blood-borne diseases, Prevalence*

## INTRODUCTION

Health care workers are exposed to a wide range of hazards in the workplace. Needlestick injury is an occupational hazard which can result in transmission of more than 20 types of blood-borne pathogens. Blood-borne pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) have been identified as the most common pathogens in occupational transmission<sup>1</sup>.

The National Institute for Occupational Safety and Health, United States defines needlestick injuries as injuries caused by needles such as hypodermic needle, blood collection needles, intravenous stylets, and needles used to connect parts of intravenous delivery systems<sup>2</sup>. The Ministry of Health Malaysia defines needlestick injury as injury caused by suture or hollow-bore needles<sup>3</sup>. In 1995, Ministry of Health Malaysia published guidelines entitled "AIDS Series –

Universal Infection Control Precautions"<sup>4</sup>. The Department of Occupational Safety and Health of Malaysia have also published a code of practice on prevention and management of HIV and AIDS for the purpose of workplace references<sup>5</sup>.

Despite the risk of transmitting blood-borne diseases in the workplace, little is known about the factors that predispose to this. Previous studies on needlestick injury mainly focused on the prevalence of injuries. This study aims also to identify the factors associated with needlestick injury.

The objectives of this study were to determine the prevalence of needlestick injury and to determine the level of knowledge of blood-borne disease and Universal Precautions, risk perception as well as the practice of Universal Precautions.

## MATERIALS AND METHODS

A cross-sectional study was conducted from August to November 2003 among health care workers in the Accident and Emergency Department of two teaching hospitals. Respondents included 22 doctors, 73 nurses, 18 medical assistants and 23 health assistants.

In this study, needlestick injury was defined as percutaneous injury caused by hollow-bore needles (the type of needle used for giving injection or drawing blood). Suturing needles were not included. Cases of needlestick injuries were respondents who had one or more experiences of needlestick injury. The episodes of needlestick injury are the total number of injuries which were experienced by the respondents within the past year. Universal sampling method was used in this study since the sampling frame was relatively small. Health care workers working in the department for more than 12 months were included. Those who refused to participate in this study were excluded. The sample size were determined using Epi Info 2000, based on the study of Norsayani & Noor Hassim<sup>6</sup> and the minimum sample size was found to be 104. The level of confidence was set at 0.05 and the power of study was 80.0%.

Structured questionnaire were used in this study to gain information on the respondents' experience in handling needles and the history of needlestick injury caused by hollow-bore needles in the past one year. For knowledge of

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blood-borne diseases, the questions were about HIV/ AIDS, Hepatitis B, Hepatitis C and Universal Precautions. Data collected were analyzed with SPSS software, version 11.5. Chi-square analysis, ANOVA and student's t-test were used to determine factors associated with needlestick injury.

## RESULTS

A total of 136 (76.0%) respondents participated in this study which gives a response rate of 81.5% (N=75) for Hospital 1 and 70.1% (N=61) for Hospital 2. It was found that majority of the respondents were Malaysian (91.9%, N=125) and most of them were Malays (85.6%, N=107). 61.8% (N=84) of the respondents were female and the average age was 29 years. The average tenure in service was 3.5 years. (Table I)

One hundred and fifteen (84.6%) subjects had handled needles. The most common procedures were venepunctures (93.9%, N=108), setting up of drips (87.8%, N=101) and giving of parenteral injections (59.1%, N=68). Table II shows the prevalence of exposure to blood and body fluids. The needlestick injury was the most common type of exposure to blood and other body fluids among health care workers (32.6%, N=43). (Table II)

Table III shows the prevalence of needlestick injuries according to job category, hospital and gender. There was a significant difference in case prevalence of needlestick injury among various job categories ( $p < 0.05$ ). Medical assistants appeared to have the highest prevalence (50.0%), followed by nurses (37.0%), doctors (22.7%) and health attendants (8.7%). The prevalence of needlestick injuries were 26 cases (34.7%) and 17 cases (27.9%) at Hospital 1 and Hospital 2 respectively. Male respondents reported a higher prevalence of needlestick injuries. Nevertheless, there were no significant gender differences in needlestick injury. (Table III)

Table IV shows the prevalence of needlestick injury episodes. There were a total of 33 episodes of needlestick injury during venepuncture, followed by 12 episodes during setting-up drips and 11 episodes during parenteral injections, minor surgeries and other procedures. Only 28 (65.1%) respondents wore gloves during procedures. Only 25 cases (58.1%) of the needlestick injury were reported and 18 (41.9%) were unreported. Failure of reporting was because it was thought not to be dangerous as the patient's blood may not be contaminated and lack of awareness that needlestick injury should be reported and to whom they should be reported. (Table IV)

The majority of the respondents (91.2%, N=124) had knowledge of blood-borne diseases. The percentage of respondents who had knowledge of Universal Precautions was slightly lower (85.3%, N=116). The mean score for knowledge of blood-borne diseases was  $27.97 \pm 2.54$  (range 21 to 33). For the knowledge of Universal Precautions, the mean score was  $9.15 \pm 1.45$  (range of 4 to 12). The range of scores for the perception of risk of blood-borne pathogen infection was 0 to 9 and the overall mean score was  $7.32 \pm 1.99$ . The mean score of practice of Universal Precautions was  $34.86 \pm 3.46$  (range of 22 to 40).

Table V shows the factors possibly associated with the occurrence of needlestick injury. There seemed to be a significant association of needlestick injury with shorter tenure in one's job. Average duration of work, knowledge of blood-borne disease and Universal Precautions were not associated with needlestick injury. Meanwhile, risk perception of blood-borne disease were higher for cases compared to non-cases but the differences were only significant for nurses, medical assistants and health attendants ( $p < 0.05$ ). (Table V)

Multivariate analysis showed that none of the factors under study could significantly predict the occurrence of needlestick injury ( $p > 0.05$ ). (Table VI)

## DISCUSSION

This study shows that health care workers in Accident and Emergency Departments were exposed to the risk of needlestick injury and transmission of blood-borne diseases such as HIV, Hepatitis B and Hepatitis C. The percentage of the respondents who received Hepatitis B immunization was 88.2% is lower than 93.0%, which were reported by Norsayani and Noor Hassim<sup>6</sup> and 89.8% by Lee and Noor Hassim<sup>7</sup>.

which is higher than previous local studies by Naing *et al.* This prevalence rate is higher than other local studies carried out before. Naing *et al.*<sup>8</sup> where the reported needlestick injury among medical students was 24.7%. Similarly, a study done by Norsayani and Noor Hassim<sup>6</sup> among medical students reported a prevalence of 14.1%. Lee and Noor Hassim<sup>7</sup> reported a needlestick injury prevalence rate among health care workers of 24.6%. The high prevalence of needlestick injury in this study may be because the tasks performed by health care workers are different from medical students in clinical postings.

**Table I: Sociodemographic characteristics of the health care workers (N=136)**

	Doctor N (%)	Nurse N (%)	Medical Assistant N (%)	Health Attendant N (%)	Total N (%)
Citizen					
Malaysian	11 (50.0)	73 (100)	18 (100)	23 (100)	125 (91.9)
Non-Malaysian	11 (50.0)	0 (0)	0 (0)	0 (0)	11 (8.1)
Ethnicity (N=125)					
Malay	8 (72.7)	64 (87.7)	17 (94.4)	18 (78.3)	107 (85.6)
Chinese	2 (18.2)	5 (6.8)	0 (0)	0 (0)	7 (5.6)
Indian	1 (9.1)	3 (4.1)	1 (5.6)	5 (21.7)	10 (8.0)
Others	0 (0)	1 (1.4)	0 (0)	0 (0)	1 (0.8)
Gender					
Male	12 (54.5)	7 (9.6)	18 (100)	15 (65.2)	52 (38.2)
Female	10 (45.5)	66 (90.4)	0 (0)	8 (34.8)	84 (61.8)

Table II: Prevalence of exposure to blood and body fluids for the past one year

	Doctor N (%)	Nurse N (%)	Medical Assistant N (%)	Health Attendant N (%)	Total N (%)
Needlestick injuries	5 (22.7)	27 (37.0)	9 (50.0)	2 (8.7)	43 (31.6)
Sharp objects injuries	0 (0)	5 (6.8)	4 (22.2)	2 (8.7)	11 (8.1)
Mucocutaneous exposures	3 (13.6)	10 (13.7)	4 (22.2)	2 (8.7)	19 (14.0)
Contact through non-intact skin	3 (13.6)	11 (15.1)	3 (16.7)	7 (30.4)	24 (17.6)

Table III: Prevalence of cases of needlestick injury for the past one year according to job category, hospital and gender

	Needlestick Injury		$\chi^2$	p value
	Yes N (%)	No N (%)		
<b>Job category</b>				
Doctor (N=22)	5 (22.7)	17 (77.3)	10.180	0.017*
Nurse (N=73)	27 (37.0)	46 (63.0)		
MA (N=18)	9 (50.0)	9 (50.0)		
Attendant (N=23)	2 (8.7)	21 (91.3)		
Total (N=136)	43 (31.6)	93 (68.4)		
<b>Hospital</b>				
1 (N=75)	26 (34.7)	49 (65.3)	0.719	0.396
2 (N=61)	17 (27.9)	44 (72.1)		
<b>Gender</b>				
Male (N=52)	18 (34.6)	34 (65.4)	0.350	0.554
Female (N=84)	25 (29.8)	59 (70.2)		

Statistical test used:  $\chi^2$ 

MA = Medical Assistant

\* Significant when  $p < 0.05$ 

Table IV: Prevalence of episodes of needlestick injuries according to the procedures carried out

	Doctor (N=22)	Nurse (N=71)	Medical Assistant (N=15)	Health Attendant (N=2)	Total (N=110)
Venepuncture	8 (36.4)	18 (25.4)	7 (46.7)	0 (0)	33 (30.0)
Setting-up drips	0 (0)	7 (9.9)	5 (33.3)	0 (0)	12 (10.9)
Parenteral injections	0 (0)	7 (9.9)	4 (26.7)	0 (0)	11 (10.0)
Minor Surgeries	1 (4.5)	4 (5.6)	2 (13.3)	0 (0)	7 (6.4)
Other procedures	0 (0)	7 (9.9)	0 (0)	2 (100)	9 (8.2)

Table V: Factors possibly associated with the occurrence of needlestick injury among respondents

	Case	Non case	Statistical test value	p value
<b>Average tenure in service (years)</b>				
Doctor	2.00	3.00	$z = 2.455$	0.014*
Nurse/ MA	3.00	4.00	$z = 2.136$	0.033*
Health Attendant	4.00	6.00	$z = 0.933$	0.351
Total	3.00	4.00	$z = 3.278$	0.001*
<b>Median Duration of Work (hour/ week)</b>				
Doctor	48.00	45.00	$z = 0.881$	0.378
Nurse/ MA	42.00	42.00	$z = 0.103$	0.918
Health Attendant	50.00	48.00	$z = 1.704$	0.088
Total	48.00	45.00	$z = 0.063$	0.950
<b>Mean score knowledge for Blood-borne Infection (Total scores : 32)</b>				
Doctor	29.00 $\pm$ 1.41	27.94 $\pm$ 3.21	$t = 0.708$	0.487
Nurse/ MA	28.14 $\pm$ 2.61	27.75 $\pm$ 2.80	$t = 0.674$	0.502
Health Attendant	26.50 $\pm$ 2.12	27.62 $\pm$ 2.40	$t = 0.634$	0.533
Total	28.16 $\pm$ 2.49	27.75 $\pm$ 2.76	$t = 0.829$	0.408
<b>Mean Score for Universal Precautions (Total score : 12)</b>				
Doctor	9.50 $\pm$ 0.71	9.50 $\pm$ 0.80	$t = 0.000$	1.000
Nurse/ MA	9.13 $\pm$ 1.43	9.00 $\pm$ 1.48	$t = 0.380$	0.705
Health Attendant	10.00 $\pm$ 0.00	9.25 $\pm$ 1.91	$t = 0.539$	0.597
Total	9.19 $\pm$ 1.37	9.13 $\pm$ 1.50	$t = 0.237$	0.813
<b>Mean score for risk perception (Total scores : 10)</b>				
Doctor	7.00 $\pm$ 1.87	7.65 $\pm$ 1.46	$t = 0.822$	0.421
Nurse/ MA	6.86 $\pm$ 2.60	7.85 $\pm$ 1.76	$t = 2.012$	0.049*
Health Attendant	5.00 $\pm$ 0.00	6.71 $\pm$ 1.42	$t = 5.535$	0.0001*
Total	6.79 $\pm$ 2.47	7.56 $\pm$ 1.68	$t = 1.848$	0.069

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	Case	Non case	Statistical test value	p value
Mean score for Practice of Universal Precautions (Total scores : 40)				
Doctor	34.20 ± 1.48	35.06 ± 3.00	t = 0.613	0.547
Nurse/ MA	34.33 ± 4.09	35.51 ± 3.17	t = 1.460	0.149
Health Attendant	33.00 ± 0.00	34.24 ± 3.77	t = 0.455	0.654
Total	34.26 ± 3.77	35.14 ± 3.29	t = 1.390	0.167

Statistical test used: Mann-Whitney test, Student's t-test

\* Significant when p&lt;0.05

Table VI: The relationship between episodes of needlestick injury with possible associated factors

Variables	b	Standard Error	p value
Duration of service (year)	-0.006	0.029	0.827
Average working hour (hour/ week)	-0.063	0.052	0.237
Mean score of knowledge of blood-borne diseases	0.066	0.073	0.368
Mean score of knowledge of Universal Precautions	0.147	0.121	0.234
Mean score of risk perception	-0.024	0.063	0.702
Mean score of practice of Universal Precautions	-0.032	0.048	0.516
Constant	2.525	2.901	0.391

This study also shows a lower rate of needlestick injury in doctors, which was 22.7%, compared to a study by Lee and Noor Hassim<sup>7</sup> who reported a 48% prevalence.

The present study showed that the prevalence of episodes of needlestick injury was 52.9% among the respondents. Lee and Noor Hassim<sup>7</sup> reported a higher prevalence of episodes of needlestick injury in a teaching hospital in Seremban (61.1%). This study also revealed that venepuncture was the most common procedure that contributed to needlestick injury. The prevalence of episodes of needlestick injury was the highest during recapping of needle after use. A study by Azmi<sup>9</sup> demonstrated that 60.7% of the Accident and Emergency Department staff in a hospital recapped needles after use.

This study found no significant difference in the level of knowledge of blood-borne pathogens and Universal Precautions among cases and non-cases. This can be explained by the fact that majority of the health care workers had attended training for blood-borne pathogens and Universal Precautions. The risk perceptions is higher in non-cases among doctors, nurses and medical assistants' (p<0.05).

Universal Precautions are a set of precautions designed to prevent transmission of blood-borne pathogens among health care workers when providing first aid or health care with the consideration that blood and certain body fluids of all patients are potentially infectious<sup>10</sup>. The cases of needlestick injury in this study had a lower mean score of practice of Universal Precautions compared to non-cases, but the difference was not statistically significant. In the study by Norsayani and Noor Hassim<sup>6</sup>, the mean score for the practice of Universal Precautions was inversely related to the occurrence of needlestick injuries (p<0.05).

Limitations of the study include non-randomization. Thus, the results cannot be generalized to all the health care workers in the participating hospitals.

## CONCLUSION

In conclusion, this study revealed that health care workers from the Accident and Emergency Departments of Hospital 1

and Hospital 2 are at risk of needlestick injury through hollow-bore needles while carrying out their duty. They are also at higher risk of blood-borne infection because the prevalence of cases and episodes are high.

It was found that needlestick injury occurred due to improper practice of Universal Precautions especially due to recapping of the needles after use, and usage of improper containers for disposal of needles. In order to reduce the risk of needlestick injury, hospital administrators as well as health care workers should know their responsibilities and practice Universal Precautions.

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