KNOWLEDGE OF BLOOD-BORNE INFECTIOUS DISEASES AND THE PRACTICE OF UNIVERSAL PRECAUTIONS AMONGST HEALTH-CARE WORKERS IN A TERTIARY HOSPITAL IN MALAYSIA

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Abstract. This study aimed to assess the knowledge of blood-borne diseases transmitted through needle stick injuries amongst health-care workers in a tertiary teaching hospital. We also aimed to assess the practices of universal precautions amongst these workers and its correlation with the facts. We carried out a cross-sectional study from January to July 2008 involving various levels of health-care workers in Serdang Hospital, Selangor, Malaysia. A self-administered questionnaire assessing knowledge of blood-borne diseases and universal precautions, and actual practice of universal precautions was used. Two hundred fifteen respondents participated in this study; 63.3% were staff nurses. The mean knowledge score was 31.84 (SD 4.30) and the mean universal practice score was 9.0 (SD 2.1). There was a small, positive correlation between knowledge and actual practice of universal precautions ($r = 0.300$, $n = 206$, $p < 0.001$) amongst the cohort studied. Factors such as age and years of experience did not contribute towards acquisition of knowledge about blood-borne illnesses or the practice of universal precautions.

Key words: knowledge, needle-borne diseases, universal practice, health-care workers

INTRODUCTION

The Center for Disease Control and Prevention (CDC) defines universal precautions as "a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV) and other blood borne pathogens when providing first aid or health care" (CDC, 1997). Universal precautions are designed to protect against exposure to blood borne pathogens using methods universally acknowledged, such as barrier methods and practice of safe disposal of sharps.

Exposure to bodily fluids, including blood, semen, and amniotic fluid, among health care workers has become an occupational health concern in Malaysia (MOH, 1998). Local studies have reported that the prevalence of needle stick injuries among health care workers is high, ranging

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from 14.7% to 52.9% (Naing *et al*, 1995; Norsayani and Noor Hassim, 2003; Lee and Noor Hassim, 2005; Ng and Hassim, 2007). Although these studies did not report the incidence of seroconversion to HIV or hepatitis amongst the reported cases, all studies were in agreement that the highest incidence of needle stick injuries occurred during venopuncture procedures or in the process of recapping needles after taking blood, procedures using hollow-bore needles. Exposure from hollow-bore needles is associated with a higher rate of transmission of blood borne pathogens, since blood remains in the bore of the needle and contains a larger volume blood and potentially a larger number of viruses than solid needles, such as suture needles (Canadian Center for Occupational Health and Safety, 2005).

Previous studies regarding needle-stick injuries mainly assessed the prevalence of needle-stick injuries and its associated factors (Naing *et al*, 1995; Norsyani and Noor Hassim, 2003; Ng and Hassim, 2007). Little is known regarding the actual level of knowledge of health care workers regarding occupational blood-borne infections and the level of practice of universal precautions in their daily work in the hospital. Our hypothesis is that there is a linear correlation between level of knowledge and practice of universal precautions practiced daily. Hence, this study was designed to assess health care workers working in a tertiary hospital regarding their level of knowledge regarding occupational blood-borne infections and level of practice of universal precautions. We also aimed to identify specific areas of weakness in knowledge and practice, since such information should be useful in identifying specific areas that need further intervention to reduce the incidence of needle-stick injuries among health care workers.

MATERIALS AND METHODS

This was a cross-sectional survey targeted at health care workers from various wards and intensive care units at a tertiary hospital, Hospital Serdang, a 620-bed multi-specialty hospital serving a population of 600,000. Apart from being a reference center for cardiology, cardiothoracic, urology and nephrologic surgery, this hospital is also a teaching hospital for the University Putra Malaysia (UPM).

Study instrument

A self-administered questionnaire was constructed from several sources: literature reviews (CDC, 1997; Canadian Center for Occupational Health and Safety, 2005; ICN, 2005), clinical guidelines (MOH, 1998; CDC, 2007) and expert opinions from the field of infectious diseases and occupational health. The questionnaire had 33 questions: respondent characteristics (10 questions), knowledge of blood borne diseases and universal precautions (13 questions) and practice of universal precautions (10 questions). Demographic characteristics included age, race, gender, job categories and years of service. The knowledge section tested participant's regarding source of information, knowledge regarding HIV/AIDS and hepatitis B, means of prevention and universal precautions. The last section evaluated the participant's degree of practice of universal precuations in daily practice. The questions were true /false in type, with one (1) point given for a true answer and zero (0) points given for a false answer. The total points were used as the score for the questionnaire; the questionnaire was prepared in English and Bahasa Malaysia as a single questionnaire.

Data collection

From April to June 2008, questionnaires were distributed to health care workers at the Serdang Hospital, Malaysia. The study sample was selected from different departments in the hospital, based on a predetermined sample size of 230. Questionnaires were distributed to each department at the start of the data collection period. At the end of seven days, the questionnaires were collected in an envelope and sealed until it was opened for data analysis. Those who failed to return the questionnaire were considered as defaulters. Questionnaires with more than two-thirds of the questions answered were used for analysis.

Data analysis

Data were analyzed with SPSS version 16.0 software. Descriptive analysis was used for demographic data. Frequency, mean and standard deviation were used to summarize the remaining data. The correlations between knowledge, practice and other variables were tested using the Pearson correlation coefficient. A *p*- value ≤0.05 was considered significant. Ethical clearance was obtained from the Medical Research Ethics Committee of the Faculty of Medicine, UPM and Ministry of Health, Malaysia. Confidentiality was maintained throughout the study period; each questionnaire was number-coded without any personal identification. Explanations regarding the intention of this survey were given in a cover letter addressed to the head of each department that participated in the survey.

RESULTS

Demographic data

A total of 240 questionnaires were distributed, with a response rate of 90.4% (217/240). Two questionnaires were incomplete, leaving 215 (89.6%) questionnaires for final analysis. The mean age of respondents was 30 years old (SD 6.0, range 20 - 54 years), three quarters of the respondents being females (77.7%). This corresponds with the distribution of the respondents in which the majority were nursing staff (63.3%). The remaining two respondents (0.9%) did not state their positions. The majority of respondents were Malay (81.2%). The mean years of service were 6.77 years (SD 5.58, range 0.08 - 20.0 years). The demographic data are found in Table 1.

Table 1
Demographic data of respondents participating in the survey.

Variable	*N* (215)	Percentage (%)
Gender		
Male	48	22.3
Female	167	77.7
Race		
Malay	173	81.2
Chinese	16	7.5
Indian	20	9.4
Others	4	1.9
Profession		
Doctor	41	19.1
Nurse	136	63.3
Assistant medical officer	34	15.8
Others	2	0.9
Undisclosed	2	0.9
Years of service (year)		
0-4	84	40.4
5-9	79	38
10-14	27	13
15-19	9	4.3
>19	9	4.3

Overall performance of total knowledge and practice of universal precautions

The mean score for a knowledge of blood-borne diseases and universal precautions was 31.84 (SD 4.30). The lowest

score was 17.0 and the highest was 39.0. Of the 215 health care workers who participated in this survey, 96.3% were above the mean score for knowledge of blood-borne diseases. Analysis of the groups showed staff nurses were the most educated (63.9%), followed by the doctors (19.5%) and the assistant medical officers (MA) (16.6%). Education through talks was the major source of knowledge (87.4%). Other sources of knowledge included books (76.3%), news and television (41.1%) and conversation with other staff (64.3%). Of the four major blood-borne illnesses evaluated in this survey, knowledge regarding HIV and hepatitis B scored the highest, at 98.6% and 94.3% respectively. Knowledge regarding hepatitis C and A scored 67.0% and 60.7%, respectively.

The mean score for practice of universal precautions was 7.95 (SD 2.15), with the highest score being 10.0 and the lowest being 2.0. A total of 75.6% scored above the mean score, 34.4% (74/215) scored the maximum total score of 10. The relationship between the total knowledge score and the universal precautions score was investigated using the Pearson correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a small, positive correlation between knowledge and practice ($r = 0.300$, $n = 206$, $p < 0.001$), with high levels of practice of universal precautions being associated with higher levels of knowledge regarding blood-borne diseases and universal precautions.

Knowledge of blood-borne diseases and universal precautions amongst health-care workers

The second part of the survey tested the knowledge among health-care workers regarding modes of transmission and prevention of HIV/AIDS and hepatitis B. Respondents were also tested for knowledge of universal precautions and compliance with universal precautions in their daily practice at the hospital. Table 2 shows the correct answers about knowledge regarding HIV/AIDS and hepatitis B among the cohort studied. Analysis using the correlation coefficient showed the level of practice of universal precautions among health care workers was not correlated with the age of the respondents ($r = 0.10$, $n = 200$, $p = 0.143$) or years of experience in working ($r = 0.115$, $n = 201$, $p = 0.104$).

DISCUSSION

To our knowledge, this is the first study from Malaysia to assess the relationship between the knowledge of blood-borne illnesses amongst medical health care workers (HCW) in a teaching hospital and the practice of universal precautions in daily practice. This study revealed several interesting findings about knowledge, practices and risk perceptions among these health care workers.

The mean knowledge score for blood-borne illnesses was 31.8, which is 79.6% of the total possible score. There was inadequate knowledge regarding hepatitis C and A. This indicates our health care workers were generally well informed about HIV and hepatitis B but ignorant about the other two diseases, which could lead to risk for themselves and their patients. A report from CCOHS reported the risk of transmitting hepatitis C through a needle stick injury ranges from 0.1 to 7.0% (Canadian Center for Occupational Health and Safety, 2005). The risk of transmitting of HBV through a needle stick injury, ranges from 1.0% to 40%. The risk of contracting hepatitis B can be reduced significantly if health care workers receive hepa-

Table 2
Proportions of correct answers for knowledge of blood-borne diseases given by respondents in the survey.

Items assessed	HIV/AIDS		Hepatitis B	
	N	%	*N*	%
A: **Modes of transmission**				
1. Insect bite *eg* mosquito	189	(88.7)	183	(87.1)
2. Shaking hands	200	(94.3)	195	(91.5)
3. Sharing needles	210	(98.1)	200	(93.9)
4. Donating blood	46	(21.6)	50	(23.5)
5. Unprotected sexual intercourse/multiple sex partners	209	(97.7)	182	(85.8)
6. Receiving contaminated blood transfusion	208	(97.2)	198	(93.0)
7. Swimming in pool	192	(89.7)	184	(86.4)
8. Eating with HIV/AIDS patient	187	(87.8)	140	(65.7)
9. Breastfeeding from HIV/hepatitis B positive mother	180	(84.1)	33	(15.5)
10. HIV positive mother to fetus transmission	196	(92.0)	179	(84.0)
B: **Transmission of diseases**				
1. Using gloves when handling blood and body fluids of the patient	205	(95.8)	201	(94.4)
2. Avoiding drug addiction	197	(92.1)	176	(82.2)
3. Avoid using services of sexual workers	206	(96.7)	196	(92.0)
4. Washing hands after contact with patient	177	(83.1)	177	(83.1)
5. Always recap needle after been used	133	(62.7)	129	(60.6)
C: **Vaccination and others**				
1. There is a vaccination to prevent HIV infection	181	(85.8)		
2. There is a vaccination to prevent hepatitis B			187	(89.0)
3. AIDS patients can be cured	180	(84.5)		
4. HIV positive carrier can be asymptomatic	161	(75.6)		
5. Hepatitis B carrier can be asymptomatic			178	(83.6)

titis B immunization. The perception that hepatitis C and A are not blood-borne diseases may cause negligence during needlestick procedures with infected patients. Patients known to have HIV or hepatitis B causes the health care worker to be more diligent during the procedure to prevent a needle strick injury by double gloving, wearing protective eye-gear and not recapping needles after use. The patients may also be given incorrect information regarding hepatitis C or A by the uninformed health care workers, especially in regard to disease-transmission and blood donation.

Approximately three-quarters of the respondents had a good knowledge about the practice of universal precautions. The study revealed some health care workers had unsafe practices, in particular the recapping of needles after use, in which approximately 60% were under the impression that needles should be recapped after use. This finding is similar to that reported by Alam *et al* (2002), Chia *et al* (1993) and Tsang *et al* (1993), who found the per-

centage of health care workers recapping needles after use ranged from 29.0% to 50.9%. A study by Lee *et al* (2005) from Malaysia showed the incidence of needlestick injuries caused by recapping needles was 14.0%, second only to injuries occurring during blood drawing procedures. Recapping needles by health care workers may occur because the worker was either unaware of the correct practice or simply following what their peers or supervisors did. The dissemination of knowledge among health care workers was mainly due to seminars and conferences. This should be taken into consideration in teaching Universal Precautions. Health care workers should be made aware that recapping needles exposes them to injury risk of contracting a blood-borne pathogen.

The study also revealed other misconceptions such as the belief eating with affected people can lead to transmission of disease, unprotected sexual intercourse results in transmission of only HIV but not hepatitis and breast feeding can transmit hepatitis B infection. The most serious misconception was the belief that donating blood was a route of transmission of blood-borne illness from one non-affected person to another. Most questions evaluated basic knowledge of universal precautions, and indicated the inadequate training of health care workers in the hospital. Being a teaching hospital, medical students carry out their clinical rotations. The health care workers, particularly the nursing staff, are information providers of the students. Not correcting misconceptions could lead to perpetuation of incorrect knowledge. Norsayani and Noor Hassim (2003) reported most medical students in Malaysia acquired knowledge from informal lectures and clinical activities (81.6%), and many developed improper working habits during their formative learning years.

This study found a correlation between knowledge and practice of universal precautions among the cohort studied. However, there were no significant correlations between the practice of universal precautions and age or years of experience of the respondents. The conflicts with the findings of earlier studies. A correlation between knowledge and practice was not seen in an earlier study by Askarian *et al* (2007). However in that study, knowledge assessed was only regarding universal precautions, not a knowledge of blood-borne illnesses, as in this current study. In a study by Kim *et al* (2001), there was a weak positive correlation between knowledge and performance of universal precautions among health care workers and medical students. Although the overall knowledge among health care workers was above the mean score, the area of weakness was its translation into daily practice by adhering to universal precautions guidelines. Age and years of experience, which many believed to be the hallmarks of good practice among nurses, were not significantly associated with knowledge or practice in this study. Our hypothesis is the extremes in age and years of experience among the nursing staffs in the hospital may have contributed to these findings. The Guidelines for universal precautions and Practices was only introduced into government hospitals in 1999. Those in service for more than 10 years may have developed their own understanding about blood-borne illnesses and peculiar methods for drawing and removing samples of blood from patients. Those who just started working might not have had the opportunity to learn the correct methods for universal precautions, while instead picking up routines from senior staff.

A knowledge of blood-borne illnesses and universal precautions should be the foundation of any safe-practice methods in the hospital. Providing a regular and systematic educational program may improve knowledge among health care workers. There may be a need to systematically evaluate health care worker knowledge on a periodic basis, rather than on a one-off basis during the nursing training curriculum. An on-going educational program regarding blood-borne illnesses and universal precautions should be created and considered part of a yearly exercise for staff at the hospital. Seminars and group sessions involving all levels of staff at the hospital should be held, since this will help the staff discuss misunderstandings pertaining to correct knowledge and practices. This is important as continuing misconceptions may lead to perpetuation of incorrect information among patients and others.

Although these results provide direction and focus for applicable interventions, caution must be exercised in generalizing them to other hospital-based populations, since this study was conducted at only one center. These data were collected in a confidential manner, but there is the possibility the respondents gave socially desirable answers. Although the number of non-responders was small, it could contribute to non-responder bias due to the possibility that compliant workers were more likely to complete the questionnaire. Under representation of other health care workers, such as physicians, lab technicians and assistant medical workers could skew the results toward nursing personnel (63.4%). Due to the nature of this study being a cross-sectional survey, we could not establish causality. We suggest that in the future, this study should be expanded to include pre- and post-educational surveys evaluating areas of weaknesses so the teaching-learning package may be improved.

In conclusion, although this study was based at only one center, the results show that health care workers at a large teaching hospital have inadequate knowledge pertaining to blood-borne illnesses and universal precautions. There were misconceptions among health care workers regarding modes of transmission and donating blood. The practice of recapping needles was still considered correct by nearly two-thirds of respondents. Since blood-borne illnesses carry potentially serious consequences to both health care workers and patients, concerted efforts from health care workers and hospitals are needed to increase knowledge and reduce the risk for blood-borne illnesses among health care workers at this hospital.

ACKNOWLEDGEMENTS

The authors wish to thank the medical students of University Putra Malaysia (Lim WB, SLM Salleh and SNS Rahman) for their support during this project. This work would not have been possible without the cooperation of the study participants and the management of Serdang Hospital, which is the training center for University Putra Malaysia, Malaysia.

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