

The Effectiveness of Needle Sticks Injury Prevention Intervention Model on Medical Students in Melaka, Malaysia: Randomized Controlled Trial

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Abstract

Background: Needle stick and sharps injuries (NSIs) are a major hazard in transmission of infectious blood borne diseases among health care workers and medical students who are at risk of injuries because of daily procedures in performing clinical activities in the hospitals.

Objectives: This study was aimed to find out the effectiveness of needle stick injury prevention intervention on medical college students in Melaka, Malaysia.

Methods: Randomized control trial was conducted and the intervention groups received the health education intervention based on the model. McNemar's test was used to compare the difference of categorical variables. For pre and post intervention analysis for same population, Paired T test was used and for comparison between intervention and control group, student t test was used.

Results: There were total 316 medical students participated in this study, 136 (43.0%) in intervention and 180 (57.0%) in control groups. The incidence of needle stick injury in intervention groups was 25 (18.4%) pre intervention and 4 (2.9%) after intervention period. The finding reveals that the knowledge of students on needle stick injury was significantly increased after intervention.

Conclusion: Implementing of needle stick injury prevention intervention gave increased knowledge among the students and motivated them to apply this knowledge in their daily clinical practice, which would lead to decrease incidence of needle stick injury among the students.

Keywords: Needle sticks injury, Medical students, Prevention and knowledge

Introduction

Needle stick and sharps injuries (NSIs) are a major hazard in transmission of infectious blood borne diseases, among health care workers and medical students who are at risk of injuries because of daily clinical procedures dealing with needles.¹ It was estimated that two million injuries cause about 66,000 hepatitis B infections, 16,000 hepatitis C and about 1,000 (200-5,000) HIV infections among 35 million health-care workers each year. These blood-borne infections have serious consequences, including long-term illness, disability and death.^{2,3} Needle sticks injury is one of the constant threat to health care

workers, especially medical students who are at high risk because of their relatively lack of experience during their clinical years.

The medical students throughout the world show a similarly high rate of sharp exposures and the study in Malaysia found that sharp injuries among medical students over one year was (23.5%) and (14.1%) respective respectively.⁴⁻⁶ The study conducted in United States reported that among graduating medical students, 57% of the exposures were needle stick injuries.⁷

According to baseline data conducted in 2011, the incidence of needle stick injury in Melaka Manipal Medical College was (23.0%).⁸ To reduce these incidences we developed our college Needle stick injury prevention model based on WHO universal precaution guidelines and Malaysia infection control guidelines with objectives to promote the students interests on the universal precaution measures on needle sticks injury and to prevent future transmission of infection through needle stick injuries. So we had set the objectives for the research to study the effectiveness of Needle stick injury prevention intervention model on accidental needle sticks injury prevention among medical students, and at the same time to determine the prevalence of needle stick injury and to determine the knowledge concern with complication and protective measure of needle stick injury by comparing among intervention and controlled group. Cases of needle stick injuries were respondents who had one or more experiences of needle stick injury. The episodes of needle stick injury are the total number of injuries which were experienced by the respondents previously.

Materials and Methods

Randomized controlled trial was conducted at Melaka Manipal Medical College, Melaka, Malaysia from September 2012 to September 2013. Participants were third year to final year Medical students who are pursuing clinical training. The needle stick injury prevention model introduced to intervention group and no intervention in control group. Sample size was calculated with 95% significance level, 80% power, produced 115 in each group.⁹ There are total 503 students from 3rd year 3 to final year 5 among medical students. Simple randomization method was used to be allotted in intervention and control groups. The students are not aware of their allotted group. Intervention group received health talk, role play performance and training on hand washing, reporting procedure and disposal of waste product was conducted. And then, pamphlets and material developed by the students was introduced. Inclusion criteria were MMMC students from 3rd year to final year who are in clinical years and exclusion criteria were student who is not willing to participate in study.

Data collection tools and methods

The data was collected in the form of pretested self-administered questionnaires and the questionnaires were developed based on the health belief model.¹⁰ The purpose of the study was explained and informed consent was obtained. For the reliability and validity of questionnaires pilot study was done 30 on the final year medical students who are about to sit for exam. The content validity was checked by experts after constructing the questionnaires.

Data management and analysis

Data were analysed by using SPSS, version 18.0. McNemar's test was used to compare the difference of categorical variables. Multiple logistic regression models will be used to adjust possible confounding variables. 95% Confidence Interval was calculated with the level of significance was set at 0.05. For pre and post intervention analysis for same

population, Paired T test was used and for comparison between intervention and control group, student t test was used. Ethical approval was obtained from two specific Ethical Review Board, Chulalongkorn University Thailand where the trial was registered and approval from Research Committee, Melaka Manipal Medical College.

Needle stick injury prevention Intervention model

This is the model developed especially for needle stick injury prevention health education intervention which was based on the training module produced by WHO and current practice done in the General Hospital in Melaka. The intervention was conducted as one day workshop and the activities involved were health talks, role plays and hands on training regarding safe injection practice, post exposure prophylaxis and hand washing procedure step by step.

Results

There were total 503 medical students in the academic year belonging to third year to final year in MMMC and 316 students participated in this study with 136 (43.6%) in intervention groups and 180 (56.4%) in control groups.

Socio demographic character of all students

Socio demographic characters of all students were shown in Table 1. The effect of intervention on hepatitis B immunization of the students before and after intervention among intervention and control groups was shown in Table 2. It was found out that the percentage of hepatitis B immunization among the students in both intervention and control groups were increased after intervention and it was statistically significant.

Regarding knowledge of needle stick injury and prevention measure, most of the students had knowledge on the diseases transmitted by contaminated sharp objects e.g., hepatitis B, C and HIV. But 148 (46.8%) of the students reported that Hepatitis C infection could be prevented by vaccine. Only, 159 (50.3%) of students were aware that needle should not be recapped after exposure to blood. 124 (39.2%) of the students correctly answered that pre-vaccination test was not necessary while 113 (43.4%) believed that post vaccination test was necessary regarding to hepatitis B immunization.

The differences of knowledge within intervention group before and after intervention were analysed by Independent T test and it was found out that the mean knowledge of students was increased from 16.54 (\pm 2.47) to 18.60 (\pm 2.05) post intervention and it was statistically significant with P value (0.000). Table 2 shows the score of students' knowledge were divided into three groups based on their maximum and minimum score and compared pre and post intervention by using Chi square analysis which have shown that the percentage of students in good category have more after intervention and it was statistically significant $P=0.010$ (Table 3).

Prevalence of needle sticks injury

The prevalence of needle stick injury among intervention group pre intervention was 25(18.4%) and it was reduced to 4 (2.9%) post intervention which was statistically significant ($P=0.00$) (Table 4).

Discussion

There were total 503 medical students in the academic year belonging to third year to final year and 316 students participated in this study. The majority of the students 141 (44.6%) were age of 23 years old. This age group grown up from adolescent and reach to

mature age so that as medical students their concern is thinking on adopting healthy behaviour is maximum in that age. In this study, all of the students were under clinical training and they have undergone all the procedures already so that by giving them well-structured health education intervention that help them during their daily practice and future work place motivate them to participate in this study. And there were other similar studies such as in a study Norsayani et al. the age of the students were as same as this study Mean age 23.9 and in a study such as, the students are same age with this study.

Regarding hepatitis B vaccination among the students, immunization status by the students were increased from (76.9%) to (90.5%) and it was statistically significant ($P=0.000$). It was facilitated by the intervention and changes their perception from perceived susceptibility to perceived threat that was lead to change in behaviour and reduces risk of getting hepatitis B infection after immunization.¹⁰ In a study by Norsayani, et al. 388 (93%) [6] immunized with hepatitis B and the immunization status of medical students in other studies was 67.7%, 86.2% and 97% accordingly.^{2,11,12}

Information regarding needle sticks injury

There were total of 63 (19.9%) of students experienced needle stick injury during their clinical training. The incidence of needle stick injury among intervention groups before intervention was 24 (18.4%) that was reduced to 4 (2.9%) after intervention. However, other research on medical students reported about higher incidence rates of injuries i.e. 33%, 26.1%, 23%, 30.8% and 39.4% respectively and lower incidence in these studies 11%, 14.1% and 13.84% respectively.^{5,13-19}

In this study, injuries were caused by hollow bore needle were 55 (87.3%) and majority was self-inflicted 49 (77.8%). Hollow bored needles were more infectious than solid needles because they have area to contain infectious blood and when it was injured on someone the infected blood were directly injected into the body. Wearing a glove is important criteria of universal precaution measure and all the health care personnel who are dealing with blood, other body fluids and dealing with patients must wear a glove as personal protective measure. In this study, there were 54 (85.7%) of students were wearing the glove during injury. In comparison with other studies there were 43) and 62.2% respectively.^{11,14} Some students thought that wearing gloves was of no benefit, as the needle would penetrate the glove.

Knowledge of needle sticks injury and prevention measure

This is one of the good parts of the study and we can generally draw conclusion and that will give contribution on our further studies and interventions. Most of the students had knowledge about the diseases transmitted by contaminated sharp objects (mean score 4.41; SD 0.8). Most of the students (99.1%, 90.5% and 96.8%) gave correct response on hepatitis B, hepatitis C and HIV was transmitted by needle stick injury. In a study by Norsayani MY et al., most of the student acquired knowledge of blood borne disease mainly from the lectures 98.3%, books 90.8% through informally 81.6%. Almost all of the participants (93%) identified that blood was the most infectious body fluid that transmitted infections through occupational exposure.¹⁶ In this study the students have knowledge regarding universal precaution measures, but regarding needle recapping; only 50.3% gave correct answer. It could be concluded that the availability of disposal bin near the procedure encouraged the students to recap the needle back. In a study by Norsayani et al, the percentage of students who acquired knowledge of universal precaution was 70.3% and in a study by Kulkarni et al., the knowledge of the study participants was high regarding standard precautions, as 70.5% (n=189) of the participants were able to identify all of the components.^{6,19}

Conclusion

Based on the study results, it was concluded that the prevalence of needle stick injury among the students were reduced on post intervention period. The students had knowledge on universal precaution guidelines such as hand washing and wearing the glove and proper disposal of sharps. The knowledge of students was significantly increased after intervention. Knowledge on hepatitis B immunization and post exposure prophylaxis measures should be encouraged among the student. It was recommended that the importance of hepatitis B immunization and importance of reporting and other post exposure prophylaxis should be added in further needle stick injury guidelines and curriculum and training among the students such as lectures related with universal precaution and short courses on infection control measures.

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References

1. Anna-Christina Lauer AR., Claus-Peter Meier-Wronski., Harald Bias., Karin Gödecke Dipl-Ing., Michael Arendt., et al. Needle stick and sharps injuries among medical undergraduate students. *American Journal of Infection Control* 2014; 42: 235-239.
2. Askarian M., Malekmakan L. The prevalence of needle stick injuries in medical., dental., nursing and midwifery students at the university teaching hospitals of Shiraz., Iran. *Indian J Med Sci* 2006; 60: 227-232.
3. Prüss-Ustün A., Rapiti E., Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med* 2005; 48: 482-490.
4. HIV/AIDS in work place 2014. Available at: <https://www.aids.gov/hiv-aids-basics/just-diagnosed-with-hiv-aids/your-legal-rights/workplace/>.
5. Shen C., Jagger J., Pearson RD. Risk of needle stick and sharp object injuries among medical students. *Am J Infect Control* 1999; 27: 435-437.
6. Norsayani MY., Noor Hassim I. Study on incidence of needle stick injury and factors associated with this problem among medical students. *J Occup Health* 2003; 45: 172-178.
7. Koenig S., Chu J. Medical student exposure to blood and infectious body fluids. *Am J Infect Control* 1995; 23: 40-43.
8. Swe KMM., Zin T., Bhardwaj A., Abbas ABL., Barua A. Prevalence of needle sticks injury among medical students of Melaka Malaysia. *European Journal of Scientific Research* 2012; 71: 214-220.
9. Lemeshow S., Hosmer DW., Klar J., Lwanga SK. Adequacy of sample size in health studies. *World Health Organization* 1990; 1-4.
10. Glanz K., Rimer BK. *Theory at a glance: a guide for health promotion practice* (2nd edn.) Washington DC: National Cancer Institute., National Institute of Health Department of Health and Human Services 2005.

11. Talas MS. Occupational exposure to blood and body fluids among Turkish nursing students during clinical practice training: frequency of needle stick/sharp injuries and hepatitis B immunisation. *J Clin Nurs* 2009; 18: 1394-1403.
12. Elliott SK., Keeton A., Holt A. Medical students' knowledge of sharps injuries. *J Hosp Infect* 2005; 60: 374-377.
13. Saleem T., Khalid U., Ishaque S., Zafar A. Knowledge., attitudes and practices of medical students regarding needle stick injuries. *J Pak Med Assoc* 2010; 60: 151-156.
14. Deisenhammer S., Radon K., Nowak D., Reichert J. Needle stick injuries during medical training. *J Hosp Infect* 2006; 63: 263-267.
15. Kebede G., Molla M., Sharma HR. Needle stick and sharps injuries among health care workers in Gondar city., Ethiopia. *Safety Science* 2012; 50: 1093-1097.
16. Dehghani Zahedani M., Mahouri K., Zare S. Incidence of needle stick injury among medical students in Bandar Abbas., Iran. *Journal of Clinical Virology* 2006; 36: S204.
17. Varsou O., Lemon JS., Dick FD. Sharps injuries among medical students. *Occup Med (Lond)* 2009; 59: 509-511.
18. Memish ZA., Assiri AM., Eldalatomy MM., Hathout HM., Alzoman H., et al. Risk analysis of needle stick and sharp object injuries among health care workers in a tertiary care hospital (Saudi Arabia). *J Epidemiol Glob Health* 2013; 3: 123-129.
19. Kulkarni V., Papanna MK., Mohanty U., Ranjan R., Neelima V., et al. Awareness of medical students in a medical college in Mangalore, Karnataka, India concerning infection prevention practices. *Journal of Infection and Public Health* 2013; 6: 261-268.

Table I: Socio economic characteristics of students (N=316).

	Intervention Group		Control group		P value
	Frequency	Percentage	Frequency	Percentage	
Age					0.68
20	3	2.2%	1	0.6%	
21	22	16.2%	24	13.3%	
22	39	28.7%	54	30%	
23	57	41.9%	84	46.7%	
24	8	5.9%	10	5.6%	
25	7	5.1%	7	3.9%	
Range: 20 to 27; Mean age: 23; SD: 1.25					
Gender					
Male	63	(46.3%)	80	(44.4%)	0.42

Female	73	(53.7%)	100	(55.6%)	
Ethnicity					
Malay	52	38.2%	80	44.4%	0.51
Chinese	51	37.5%	57	31.7%	
Indian	30	22.1%	36	20.0%	
Others	3	2.2%	7	3.9%	
HBV immunization					
Yes	109	80.1%	134	74.4%	0.23
No	27	19.9%	46	25.6%	
Exposure to HE on NSI					
Yes	28	20.6%	53	29.4%	0.07
No	108	79.4%	127	70.6%	
Total	136		180		

Table II: Knowledge difference among intervention and control group before and after intervention Pair sample test N=136.

Knowledge difference	Pre-intervention Mean(SD)	Post intervention Mean(SD)	Mean difference	P value
Intervention gps	16.54(2.467)	18.60(2.049)	2.06	0.000
Control group	16.17(3.59)	13.32(3.83)	-2.86	0.000

Table III: Level of knowledge on needle stick injury and universal precaution among intervention groups pre and post intervention.

Knowledge	Pre-intervention	Post intervention	P-value
Range- 5-23			Chi square-13.1
Good(23-18)	30(22.1%)	80(58.8%)	0.010
Fair(17-12)	101(74.3%)	55(40.4%)	

Poor(less than 12) 5(3.7%) 1(0.7%)

Table IV: Prevalence of needle sticks injury among intervention and control groups.

	Intervention			Control		
	Pre	Post	P Value	Pre	Post	P Value
Total injury	Yes 25 (18.4%)	4 (2.9%)	0.00	38 (21.1%)	7 (93.9%)	0.00
	No 111 (81.6%)	132 (97.1%)		142 (78.9%)	173 (96.7%)	