# Effectiveness of an Educational Intervention Module to Increase Knowledge, Health Belief and Practices of Work-Related Injuries Among Healthcare Workers in the Malaysian Armed Forces

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**ABSTRACT:**

**Introduction**: Statistics show that a hospital is one of the most hazardous places to work. Healthcare workers (HCW) in hospitals are exposed to physical, chemical, biological, ergonomics and psychosocial hazards that may cause serious injuries. Because there is widespread ignorance of the hazard, awareness must be increased about the harmful effects of injuries and about the prevention and control of WRI mainly through health behaviour changes. **Objective**: To develop, implement and evaluate the effectiveness of a Health Belief Model based educational intervention on WRI among healthcare workers. This program is expected to create awareness and enhance the knowledge in relation to practices of WRI and its prevention among the HCW. **Materials and Methods**: A clustered randomised controlled trial study was conducted in 2 military hospitals. All participants, who fulfilled the selection criteria, were recruited via stratified random sampling. The study instrument used was a self-administered questionnaire. Intervention group received an educational based intervention on WRI. The intervention and control groups were compared at 1 and 6-months post-baseline using RM-MANCOVA to determine the significant changes between and within groups using Statistical Package for the Social Sciences (SPSS), version 23.0. **Result**: There were statistically significant differences between intervention and control group on the combined dependent variables after controlling for covariates with $F=79.679$, $p<0.001$, Wilks' $\Lambda = 0.464$, $\eta 2=0.536$ and statistically significant differences within group subjects and time on the combined dependent variables after controlling for covariates with $F=66.962$, $p<0.001$, Wilks' $\Lambda = 0.337$, $\eta 2=0.663$. **Discussion**: The educational intervention delivered proved to be a success with a change in knowledge, health belief and practice during the 6 months' period. Effect sustainability study must be followed up and education must be implemented to improve the occurrences of WRI among healthcare workers.

**Keywords**: Work-Related Injury (WRI), Health Belief Model, Healthcare Workers

## INTRODUCTION

Globally 6,300 people die per day as a result of occupational accidents or work-related diseases, accounting to more than 2.3 million deaths per year[1] . Around 317 million accidents occur on the job annually with many of these resulting in extended absences from work. The human cost of this daily adversity is vast and the economic burden of poor occupational safety and health practices is estimated at 4 percent of global Gross Domestic Product each year [1]

In Malaysia, the trend of WRI occurrence seems to be worrying as well. Adinegara et al. conducted a secondary data analysis of the Social Security Organization on Malaysia (SOCSO) database to examine the incidence of fatal occupational injuries in Malaysia. This refers to the death of an employee in the workplace as a result of any injury occurring during employment. This analysis had revealed a total of 2822 fatal occupational injuries with an average annual incidence of 9.2 fatal occupational injuries per 100,000 workers. SOCSO statistics on WRI claims only cover privately employed workers. Therefore, the numbers of WRI could be much higher if WRI that involved government servants and the self-employed are included. This figure is more than double higher than that in the United States (4.0 per 100,000) [US Bureau of Labor Statistics, 2006]) and almost 13 times more than Great Britain (0.71 per 100,000) [Health and Safety Executive UK, 2006]) [2].

In terms of non-fatal occupational injuries in Malaysia, between the years 2002-2006 there were a total of 249,904 non-fatal occupational injuries occurring in 211,875 individuals. In relevance to that, more than MYR 912 million was paid out for temporary and permanent disablement and invalidity benefits in 2012 indicating a large number of insured persons on temporary or permanent disablement benefits and invalidity benefits[3]. Similar trends were observed in permanent disablement recipients and permanent invalidity recipients over the past years, which make up the main share of the compensation pay-out. This shows the significant effect of WRI on one's country economics burden.

Healthcare facilities (HCFs) are institutions that provide healthcare services, including counselling, clinical, surgical, and/or psychiatric consultations and treatment services for the healthy, sick and the injured [4]. Globally, HCFs employ over 59 million workers and offer a variety of services to clients and patients and are classified as hazardous and high-risk work places[5]. Workers in this sector are exposed to all types of workplace hazards which includes physical hazard (noise, vibration, lighting, cuts, electrocution, contusion, falls, trips and commuting accidents), chemical hazard (burns, inhalation, scalding), biological hazard (needle prick injuries, infections), ergonomic (lower back pain, sprain, strain) and psychosocial hazard (stress, violence)[3].

Statistics show that a hospital is one of the most hazardous places to work. In 2011, U.S. hospitals recorded 253,700 work-related injuries and illnesses, which computes to an incidence rate of 6.8 work-related injuries and illnesses for every 100 full time employees[6] . Rates of OSHA-recordable injuries and illnesses are broadly decreasing in all industries in the United States, including in hospitals but still pose a threat to the workforce.

Furthermore, the injury and illness rate in hospitals is higher than the rates in construction and manufacturing, two industries that are traditionally thought to be relatively hazardous (Figure 1) [6]. While this was not the case 20 years ago, improvements in workplace safety in both construction and manufacturing have surpassed those in hospitals.

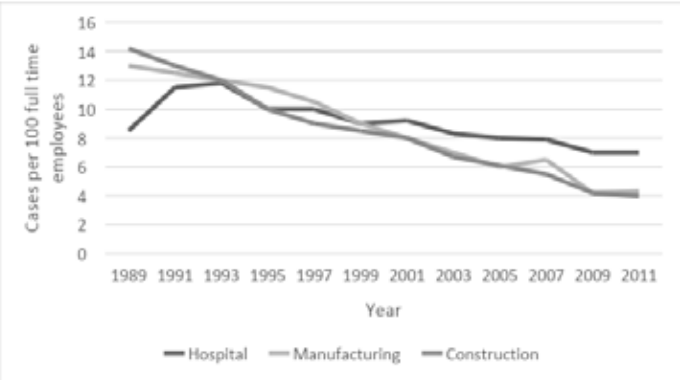


**Figure 1: Injury and illnesses rates by industry in the U.S., 1989–2011 [6]**

In Malaysia, work-related injuries are not paid sufficient attention upon. Many work-related injuries are treated as outpatient and not notified as injuries due to occupation. Throughout these years, the main work-related injuries in Malaysia that require notification are needle stick injuries. The Occupational Health Unit in the Ministry of Health had reported an incidence rate of 4.7 needle stick injuries per 1,000 HCW's in 2005 [7]. Although sharps injuries are one of the most common types of injuries incurred by healthcare workers, the estimated rates of injury can vary due to uncertainties about under reporting. Instances of occupational blood-borne virus transmission have been reported widely, but assessments of transmission incidence and absolute risk of infection have rarely been published [7].

The military hospitals in Malaysia operate similarly as a government hospital in terms of coverage, staff, departments and administrations. Although many interventions are being done to curb injuries, especially needlestick injuries, one of the military hospitals in Malaysia showed an increasing trend in NSI cases. It recorded 4 cases in 2016 (1 medical officer, 2 staff nurses and 1 community nurse), 5 cases in 2017 (1 specialist, 1 student, 1 house officer and 2 technicians) and 7 cases in 2018 (2 health assistants, 4 nurses and 1 house officer) [8] . Although the number is small, it should be noted that NSI is totally preventable and should not be happening in the first place.

The knowledge and experience gained by effective health behaviour intervention programs can be applied to workplace WRI prevention programs to address the workers lack of awareness and concern about the risks of injuries at work.

This study is done to demonstrate the effect of an educational module on work-related injuries (WRI) and its prevention in order to increase the knowledge, health belief and practices among healthcare workers (HCW). This program is expected to create awareness and enhance the knowledge in relation to practices of WRI and its prevention among the HCW. The evidence from this study could facilitate the healthcare provider organisation in paying special attention to WRI especially notification as prevention and early intervention programmes are important to protect the HCW from experiencing WRI and its complications.

## METHODOLOGY

The study was conducted in 2 out of 4 hospitals which is Hospital Angkatan Tentera Tuanku Mizan (HATTM) located in Wilayah Persekutuan Kuala Lumpur and Hospital Angkatan Tentera Lumut (HATL) located in Lumut, Perak. This study followed the CONSORT statement for extension in clustered randomised controlled trial (Campbell, Piaggio, Elbourne & Altman, 2012). The intervention group will receive a 1-day educational based programme on WRI while the control group was monitored and given the same intervention after completion of study (6 months) in view of the benefits of the intervention programme. The study population in this study were all HCWs working in both the military hospitals selected randomly for the purpose of this study which includes HATL and HATTM. They included 3 groups of HCWs which are the management group (administrative workers), supporting group (nurses, technicians, medical assistants) and professional group (medical officers, specialists, consultants) [9]. The sample size (n) for this study is calculated using the mean formula for hypothesis testing by Charan and Biswas (2013) and took into account the design effect giving a total of 220 respondents (110 in each group). The sampling method that was used in this study is the stratified random sampling method and was single blinded. A self-administered questionnaire in both English and Malay language was used in this study to collect information on social-demographic characteristics, employment characteristics, knowledge, health belief and practices among HCWs in the selected hospitals.

## RESULTS

The sociodemographic characteristics of participants between intervention and control group at baseline is shown in Table 1 below.

The employment characteristics of participants between intervention and control group at baseline is shown in Table 2 below.

**Table 1: The sociodemographic characteristics of participants between intervention and control group at baseline.**

| Characteristics | Group, n (%) | | Test | Value | df | p-value |
|---|---|---|---|---|---|---|
| | Intervention | Control | | | | |
| **Gender** | | | $x^2$ | 1.196 | 1 | 0.169 |
| Male | 42 (38.2) | 50 (45.5) | | | | |
| Female | 68 (61.8) | 60 (54.5) | | | | |
| **Race** | | | | | | |
| Malay | 96 (87.3) | 91 (82.7) | $x^2$ | 1.326 | 3 | 0.723 |
| Indian | 5 (4.5) | 8 (7.3) | | | | |
| Chinese | 3 (2.7) | 5 (4.5) | | | | |
| Others | 6 (5.5) | 6 (5.5) | | | | |
| **Marital status** | | | | | | |
| Single | 23 (20.9) | 30 (27.3) | $x^2$ | 4.159 | 3 | 0.245 |
| Married | 81 (73.7) | 68 (61.8) | | | | |
| Divorced | 3 (2.7) | 7 (6.4) | | | | |
| Widowed | 3 (2.7) | 5 (4.5) | | | | |
| **Education level** | | | | | | |
| Diploma | 56 (50.9) | 58 (52.7) | | | | |
| Degree | 34 (30.9) | 39 (35.5) | $x^2$ | 3.184 | 3 | 0.364 |
| Masters | 18 (16.4) | 13 (11.8) | | | | |
| PhD | 2 (1.8) | 0 (0.0) | | | | |

**Table 2: The employment characteristics of participants between intervention and control group at baseline**

| | Group, n (%) | | Test | Value | df | p-value |
|---|---|---|---|---|---|---|
| | Intervention | Control | | | | |
| **Work group** | | | | | | |
| Administrators | 27 (24.5) | 19 (17.2) | | | | |
| Supporting | 65 (59.11) | 73 (66.4) | $x^2$ | 1.855 | 2 | 0.396 |
| Professional | 18 (16.4) | 18 (16.4) | | | | |
| **Employment** | | | | | | |
| Permanent | 92 (83.6) | 97 (88.2) | $x^2$ | 0.939 | 1 | 0.219 |
| Contract | 18 (16.4) | 13 (11.8) | | | | |
| **Oncall involvement** | | | | | | |
| Yes | 38 (34.5) | 52 (47.3) | $x^2$ | 3.685 | 1 | **0.037** |
| No | 72 (65.5) | 58 (52.7) | | | | |
| **Part Time involvement** | | | | | | |
| Yes | 2 (1.8) | 9 (8.2) | $x^2$ | 4.689 | 1 | 0.059 |
| No | 108 (98.2) | 101 (91.8) | | | | |

According to Wilk's Lambda test (most commonly used), there are significant between group and within group differences among intervention and control group with F=89.679, p<0.001, Wilks' Λ = 0.445, η2=0.555 and F=143.777, p<0.001, Wilks' Λ = 0.198, η2=0.802 respectively on a linear combination of knowledge, health belief and practice.

**Table 3: MANNOVA between group and within group differences**

| Effect | Value | F | df | η2 | p-value |
|---|---|---|---|---|---|
| Between subjects & group (Wilks' Lambda) | 0.445 | 89.679 | 216.000 | 0.555 | <0.001 |
| Within subjects & time (Wilks' Lambda) | 0.198 | 143.777 | 213.000 | 0.802 | <0.001 |

Since sphericity could not be assumed, the Greenhouse-Geisser test in this study shows that TIME was a significant predictor of knowledge F(1.467, 319.886)=21.657, p<0.001, η2=0.090. TIME was also a significant predictor of health belief F(1.530, 333.524)=349.240, p<0.001, η2=0.616. TIME was also a significant predictor of practice F(1.764, 384.618)=65.793, p<0.001, η2=0.232. For within group interaction, both the intervention and control group interacted with TIME to predict knowledge F(1.467, 319.886)=6.2, p=0.006, η2=0.028, health belief F(1.530, 333.524)=180.822, p<0.001, η2=0.453 and practice F(1.764, 384.618)=90.288, p<0.001, η2=0.293.

**Table 4: Univariate Test showing interaction between time and group**

| Source | Measure | F | df | η2 | p-value |
|---|---|---|---|---|---|
| Time | Knowledge | 21.657 | 1.467, 318.886 | 0.090 | <0.001 |
| | Belief | 349.240 | 1.530, 333.524 | 0.616 | <0.001 |
| | Practice | 65.793 | 1.764, 384.618 | 0.232 | <0.001 |
| Time & Group | Knowledge | 6.2 | | 0.028 | <0.001 |
| | Health Belief | 180.822 | 1.467, 319.886 | 0.453 | <0.001 |
| | Practice | 90.288 | 1.530, 333.524 | 0.293 | <0.001 |
| | | | 1.764, 384.618 | | |

For between group interaction, intervention and control group was predictive of differences in knowledge F(1,218)=17.010, p<0.001, n2=0.72, health belief F(1,218)=187.733, p<0.001, η2=0.463 and practice F(1,218)=81.405, p<0.001, η2=0.272 even after using a Bonferroni-type adjustment (adjusted α= 0.05/3 = 0.017).

**Table 5: Test of between group effects**

| Source | Measure | F | df | η2 | p-value |
|---|---|---|---|---|---|
| Group | Knowledge | 17.010 | 1, 218 | 0.72 | <0.001 |
| | Health Belief | 187.733 | 1, 218 | 0.463 | <0.001 |
| | Practice | 81.405 | 1, 218 | 0.272 | <0.001 |

**Table 6: Mean scores for knowledge, health belief and practice in both intervention and control group at baseline, 1-month and 6-month post intervention**

| Scores | Group, Mean (SD) | | Total (n=220) |
|---|---|---|---|
| | Intervention (n=110) | Control | |
| **Knowledge** | | | |
| Baseline | 17.31 (2.123) | 17.21 (2.077) | 17.26 (2.096) |
| 1-month | 18.80 (1.573) | 17.72 (2.073) | 18.26 (1.914) |
| 6-month | 18.05 (1.380) | 17.03 (1.956) | 17.54 (1.766) |
| **Health belief** | | | |
| Baseline | 106.78 (8.869) | 106.45 (6.669) | 106.61 (7.830) |
| 1-month | 126.92 (6.084) | 106.45 (6.669) | 118.88 (10.495) |
| 6-month | 122.03 (5.325) | 106.61 (7.830) | 114.29 (10.034) |
| **Practice** | | | |
| Baseline | 51.11 (6.028) | 50.40 (6.522) | 50.75 (6.276) |
| 1-month | 62.26 (5.485) | 49.53 (5.906) | 55.90 (8.548) |
| 6-month | 52.64 (5.884) | 50.30 (6.122) | 51.47 (6.104) |

Plot below shows the mean scores for knowledge, health belief and practice at baseline, 1-month and 6-month post intervention. The graph demonstrates that there were significant differences in all knowledge, health belief and practice in the intervention group compared to the control group. The differences that exist between groups are statistically attributed to the intervention programme.

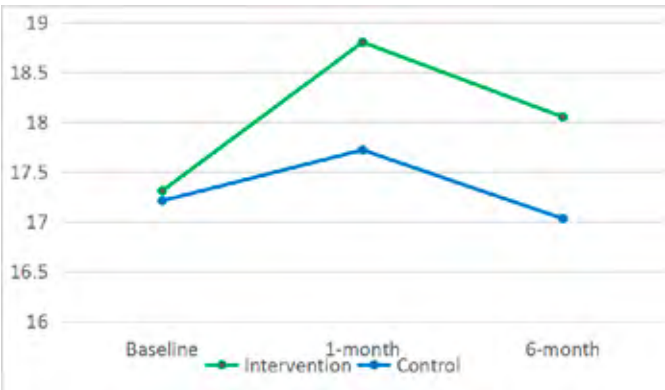


**Figure 2: Mean score for knowledge at baseline, 1-mth and 6-mth post intervention between intervention and control group**

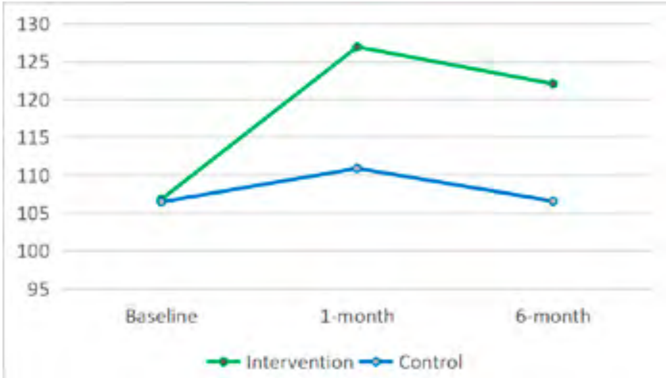


**Figure 3: Mean score for practice at baseline, 1-mth and 6-mth post intervention between intervention and control group**

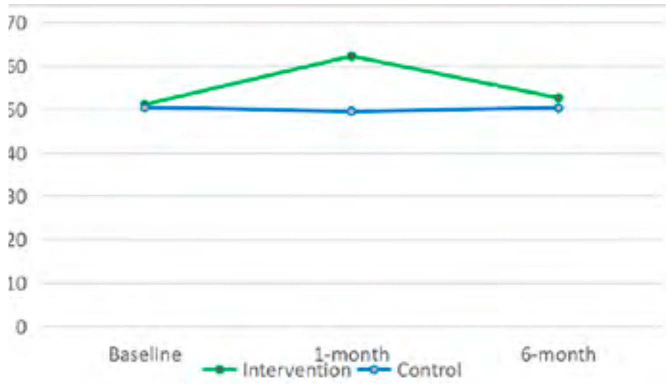


**Figure 4: Mean score for practice at baseline, 1-mth and 6-mth post intervention between intervention and control group**

In order to determine the relationship between pretest and post test scores of knowledge, health belief and practice, the baseline scores were used as a covariate and ANCOVA was done for each DV separately before analysing them together.

For knowledge, there is no significant relationship between the CV and DV ($p=0.725$). Baseline knowledge score only explained 0.1% of the variance in the post-test knowledge score. However, after adjusting for baseline knowledge scores, there was a significant difference between the intervention and control group on post-intervention knowledge scores, $F(1,217) = 20.089$, $p<0.001$, partial $\eta 2= 0.085$. There was not a strong relationship between pre-test and post-test scores on knowledge, as indicated by a partial eta square value of 0.001.

For health belief, there is a significant relationship between the CV and DV ($p<0.001$). Baseline health belief score only explained 13.3% of the variance in the post-test health belief score. After adjusting for baseline health belief score, there was a significant difference between the intervention and control group on post-intervention knowledge scores, $F(1,217) = 366.995$, $p<0.001$, partial $\eta 2= 0.628$. There is a strong relationship between pre-test and post-test scores on health belief, as indicated by a partial eta square value of 0.628.

For practice, there is significant relationship between the CV and DV (p=0.038). Baseline practice score explained 2.0% of the variance in the post-test practice score. After adjusting for baseline practice score, there was significance difference between the intervention and control group on post-intervention practice scores, F(1,217) = 7.757, p=0.006, partial η2= 0.035. There was a strong relationship between pre-test and post-test scores on practice, as indicated by a partial eta square value of 0.035.

**Table 7: Test of between subject effects for knowledge, health belief and practice after using each baseline scores as covariate**

| Source | F | df | η2 | p-value |
|---|---|---|---|---|
| Knowledge score | 0.124 | 1, 217 | 0.001 | 0.725 |
| Group | 20.089 | 1, 217 | 0.085 | <0.001 |
| Health Belief score | 33.145 | 1, 217 | 0.628 | <0.001 |
| Group | 366.995 | 1, 217 | 0.133 | <0.001 |
| Practice score | 4.349 | 1, 217 | 0.020 | 0.038 |
| Group | 7.757 | 1.127 | 0.035 | 0.006 |

According to Wilk's Lambda test (most commonly used), there are statistically significant differences between intervention and control group on the combined dependent variables after controlling for covariates with F=79.679, p<0.001, Wilks' Λ = 0.464, η2=0.536 and statistically significant differences within group subjects and time on the combined dependent variables after controlling for covariates with F=66.962, p<0.001, Wilks' Λ = 0.337, η2=0.663.

**Table 8: RM-MANCOVA between group and within group difference**

| Effect | Value | F | df | η2 | p-value |
|---|---|---|---|---|---|
| Between subjects & group (Wilks' Lambda) | 0.464 | 79.679 | 207.000 | 0.536 | <0.001 |
| Within subjects & time (Wilks' Lambda) | 0.337 | 66.962 | 204.000 | 0.663 | <0.001 |

In the Multivariate test, there are no significant main effect for any of the covariates. Therefore there were no significant main effect of the covariates on the intervention and control group. Thus, a post hoc test was not done.

**Table 9: Multivariate test between and within group on effect of covariates**

| Effect | | Value | F | df | η2 | p-value |
|---|---|---|---|---|---|---|
| Between subjects & group (Wilks' Lambda) | Age | 0.979 | 1.455 | 207.000 | 0.021 | 0.228 |
| | Gender | 0.972 | 2.008 | 207.000 | 0.028 | 0.114 |
| | Marital status | 0.995 | 0.328 | 207.000 | 0.005 | 0.805 |
| | Education level | 0.981 | 1.361 | 207.000 | 0.019 | 0.256 |
| | Income | 0.987 | 0.888 | 207.000 | 0.013 | 0.448 |
| | Work experience | 0.979 | 1.462 | 207.000 | 0.021 | 0.026 |
| | Working hours | 0.974 | 1.836 | 207.000 | 0.026 | 0.142 |
| | On call | 0.968 | 2.284 | 207.000 | 0.032 | 0.080 |
| | Part time | 0.998 | 0.160 | 207.000 | 0.002 | 0.923 |
| Within subjects & time (Wilks' Lambda) | Age | 0.972 | 0.996 | 204.000 | 0.028 | 0.429 |
| | Gender | 0.951 | 1.752 | 204.000 | 0.049 | 0.111 |
| | Marital status | 0.975 | 0.863 | 204.000 | 0.025 | 0.523 |
| | Education level | 0.946 | 1.932 | 204.000 | 0.054 | 0.077 |
| | Income | 0.962 | 1.325 | 204.000 | 0.038 | 0.247 |
| | Work experience | 0.969 | 1.089 | 204.000 | 0.031 | 0.370 |
| | Working hours | 0.967 | 1.171 | 204.000 | 0.033 | 0.323 |
| | On call | 0.944 | 2.013 | 204.000 | 0.056 | 0.065 |
| | Part time | 0.959 | 1.437 | 204.000 | 0.041 | 0.202 |

## DISCUSSION

The covariates taken into account as control for this study were age, gender, education level, marital status, average monthly income, working experience, average working hours per week, involvement in part time and involvement in extra time.

There were statistically significant differences between intervention and control group on the combined dependent variables after controlling for covariates and statistically significant differences within group subjects and time on the combined dependent variables after control. In the Multivariate test, there are no significant main effect for any of the covariates. Therefore there were no significant main effect of the covariates on the intervention and control group. Thus, a post hoc test was not done.

Majority studies showed significant improvement in the research subject using education as part of their intervention strategy [10-13]. An educational intervention study by Salah (2012) on performance of intensive care nurses to decrease lower back pain found that the educational program was helpful on the knowledge improvement and practices of the nurses with back pain, but it did not decrease intensity of back pain and disability [10]. However, this study had a low number of participants. Two of those studies mentioned and used specific behavioural or training model namely Health Belief Model and Kirkpatrick's Model [9, 14]. Florence Folami (2010) in her study on 2 educational intervention methods on nurses adoption on safe patient handling showed significant reduction in injury reports with both self regulated learning (SRL) and interactive workshop (IW) [9]. Nevertheless, the study had few limitations which include convenient sampling and data depended heavily on cases reporting by nurses. The results from the execution of a continuing education program showed that through designing training programs and raising awareness in nursing personnel, we can reduce occupational exposure to needle stick injuries.

## CONCLUSION

In summary, analysis of outcome revealed that the educational intervention was effective in improving the level of knowledge, health belief and practices on WRI among HCWs. There were no significant differences in all the variables measured between both groups at baseline, signifying successful randomization. The magnitude of the increase was significantly larger in the intervention group receiving intervention compared to the control group that received no intervention after controlling covariates. In conclusion, the results from primary analysis failed to reject the alternative hypothesis that the educational intervention module on WRI among HCWs is effective in increasing the level of knowledge, health belief and practices on WRI among the respondents in the intervention group at one month and six months post intervention after controlling for covariates. It is recommended that future researches would be able to utilise cluster randomised trial designs to enhance comparability of results. In addition, trial protocols should strictly adhere to CONSORT statements in order to improve quality of results.

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