

IMPROVEMENT OF KNOWLEDGE, ATTITUDE, BELIEF AND PRACTICES ON MERCURY SPILLAGE MANAGEMENT AMONG HEALTH CARE WORKERS AFTER AN EDUCATIONAL PROGRAM

Ameerah Su'ad **Abdul Shakor**¹, Ruzanaz Syafira **Ruzman Azlee**¹, Muhammad Alfatih **Pahrol**¹, Nadia **Mohamad**¹, Syahidiah Syed Abu **Thahir**¹, Rosnawati **Muhamad Robat**², Normazura **Mustapa**³, Thahirahtul Asma **Zakaria**⁴, Sirajuddin **Hashim**⁴, Norlen **Mohamed**⁴, Rafiza **Shaharudin**¹

¹*Environmental Health Research Center, Institute for Medical Research, National Institutes of Health Malaysia, Ministry of Health Malaysia, Jalan Setia Murni U13/52, Seksyen U13 Setia Alam, 40170 Shah Alam, Selangor, Malaysia.*

²*Occupational and Environmental Health Unit, Selangor State Health Department, Ministry of Health Malaysia, No 1 Wisma Sunway, Jalan Tengku Ampuan Zabedah C 9/C, Seksyen 9, 40100 Shah Alam, Selangor, Malaysia.*

³*Occupational and Environmental Health Unit, Malacca State Health Department, Ministry of Health Malaysia, Jalan Business City, Melaka International Trade Centre, 75450 Melaka, Malaysia.*

⁴*Disease Control Division, Occupational and Environmental Health Sector, Ministry of Health Malaysia, Complex E, Federal Government Administrative Centre, 62590 Putrajaya, Malaysia.*

**Corresponding author: Ameerah Su'ad Abdul Shakor, Environmental Health Research Center, Institute for Medical Research, National Institutes of Health Malaysia, Ministry of Health Malaysia, Jalan Setia Murni U13/52, Seksyen U13 Setia Alam, 40170 Shah Alam, Selangor.ameerahsu3ad@gmail.com*

ABSTRACT

Health care workers (HCWs) may be exposed to mercury in situations such as mercury spillage from broken thermometers and sphygmomanometers. However, if proper clean up measures are taken, the risk of mercury poisoning is low. The objectives of this study were to: 1) assess the knowledge, attitude, belief and practices (KABP) among HCWs on mercury spillage management; 2) apply an educational program regarding the appropriate mercury spillage handling; 3) assess the improvement of KABP levels among HCWs after the program. An interventional study was conducted in nine hospitals and 63 health clinics across Selangor and Malacca, from September 2017 until February 2019. The KABP levels of the HCWs were measured before and, six months after the educational program was conducted. The program consisted of a series of lectures, demonstration video and simulation training. The assessment was performed using a validated self-administered questionnaire and all responses were kept anonymous. KABP levels before and after the program were then compared using chi-square test. The total study population showed a significant improvement in the knowledge ($p < 0.001$), attitude ($p = 0.001$) and practice ($p < 0.001$) levels after the program. Improvement in the belief level was however not statistically significant ($p = 0.093$). Our study highlights the need for an enhanced training module in mercury spillage management to ensure that HCWs are capable of handling the hazardous waste correctly. The results showed that, our educational program was effective and therefore could be applied in healthcare facilities to improve HCWs competency on mercury spillage management.

KEYWORDS: Waste Management, Occupational Safety, Education, Community Trial, KAP

INTRODUCTION

Elemental mercury (Hg) is a heavy, shiny, silvery liquid commonly found in schools and universities (20%), healthcare facilities (17%), residents (17%), public utilities (13%) and industrial sites (10%) (1). Health care workers (HCWs) may be at risk of Hg exposure in cases of leakage or spillage from broken and obsolete Hg-containing devices (2), poor practices during handling dental amalgam (3), and inappropriate clean up measures of mercury spills (4).

The most anticipated exposure of Hg is from the inhalation process, other possible exposure routes include dermal contact and ingestion. Inhalation of Hg vapour is the major route of Hg exposure as it is extremely volatile at room temperature (5). The clinical presentation of Hg poisoning varies depending on the dose, duration and form of exposure. Individuals acutely exposed to Hg may present with respiratory symptoms (cough, breathing difficulty), gastrointestinal symptoms (metallic taste in the mouth, nausea, vomiting, diarrhoea), skin rashes, eye irritation, and fever (5). Whereas, chronic exposure or acute exposure to extremely high levels of Hg may induce more devastating effects to the brain, liver, cortex of kidneys and developing fetuses (6,7).

There were series of Hg spillage incidences that were reported in the Ministry of Health Malaysia (MOH) healthcare facilities, with 25 cases in 2016, 14 cases in 2017 and two cases in 2018 (8). However, there are limited data on health effects as a result of these Hg spillages. Inappropriate management of Hg spillages may unnecessarily expose HCWs and patients to Hg hazards. Until all Hg-containing medical devices are completely removed from healthcare facilities, the risk of exposure to Hg vapour could not be completely removed.

Effective and adequate training are vital components in equipping HCWs with the proper knowledge and skills to handle Hg spillages. As per current practice, the training offered to HCWs for handling Hg spillage is provided in the form of brief lectures given once to twice yearly during the Continuing Medical Education (CME) and Continuing Nursing Education (CNE) sessions. In view of Hg spillages in hospitals are usually managed by concession companies, these CME and CNE sessions were targeted more towards HCWs working in health clinics as compared to those working in hospitals. In this regard, it could be anticipated that many HCWs were not trained to handle Hg spillages

competently.

Accordingly, we developed a training program which utilized a combination of theoretical and practical approach to address: 1) a continued problem of inappropriate management of Hg spills in MOH healthcare facilities; 2) ensure HCWs received equally effective training, and thus; 3) assist HCWs to develop Hg handling competencies. And to our best knowledge, there are currently no published studies evaluating the impact of an educational program on the knowledge, attitude, belief and practices (KABP) regarding Hg hygiene among HCWs. Therefore, our study aimed to assess the impact of our training program on the levels of KABP regarding mercury spillage management among HCWs.

MATERIALS AND METHODS

Study setting

This study was an interventional study conducted in 72 randomly selected MOH healthcare facilities (9 hospitals and 63 health clinics) across the states of Selangor and Malacca from September 2017 until February 2019.

Sample size

The sample size was determined by applying two proportions (independent observation) formula based on a study by Kumar et al (9). It was discovered that the proportion of good knowledge regarding infectious waste among health staff pre-intervention was 55% whereas the proportion increased to 75% post-intervention with $\alpha=0.05$ and 80% power of study (9). In view of the possibility of high turnover rate among HCWs (10), and as suggested by the Occupational Health Unit, MOH representatives, an additional 40% of subjects from the calculated sample size was included to overcome the high chances of drop out from the subjects. Therefore, the target sample size was 520 subjects per arm.

Study population

The number of participants from each hospital and health clinic were determined by probability proportionate to size. Participants in this study were randomly selected from nine hospitals (seven in Selangor and two in Malacca) and 63 health clinics (44 in Selangor and 19 in Malacca), which were also randomly selected from all MOH healthcare facilities in the two states. The number of healthcare facilities in Selangor and Malacca segregated for participation in this study was decided based on the number of HCWs required

from each healthcare facility to participate as the study respondent, proportionate to the total number of eligible respondents from each facility. Inclusion criteria for the respondents were HCWs working in wards and clinics, while HCWs in radiology, laboratory and administrative units were excluded from the study on the basis that they are at minimal risk of Hg exposure as they do not handle Hg-containing equipment.

Participants were kept anonymous to encourage truthful responses, and to avoid the HCWs from deliberately anticipating the post-intervention survey (11). To reduce bias in respondent selection, a complete list of HCWs names from each of the selected healthcare facilities were obtained prior to questionnaire distribution. Using stratified random sampling based on the healthcare facility (either hospital or health clinic), 520 HCWs were selected to participate in an evaluation before and after the program. All selected study participants were then approached and invited to participate in the study. Those who agreed to participate gave written informed consent.

Educational Program

The educational program was constructed by the authors and reviewed by a panel of experts in public health, occupational and environmental health. The program was first delivered in a training of trainers (TOT) session to representatives from all MOH healthcare facilities in Selangor and Malacca; which consisted of a group of occupational health officers, doctors, head nurses, nurses and medical assistants. The program included lectures, a video demonstration and a simulation training on Hg spillage management.

The lectures were on physical and chemical properties, adverse health effects of Hg, safe Hg spillage handling procedures, and management of exposed victims. Following the lectures, an eight-minute video developed by the authors demonstrating the correct method for Hg spillage management was shown to the representatives. In addition to the lectures and video demonstration, the representatives were also given a hand-on simulation training. During the simulation training, pieces of glass pipettes were used to represent broken glass thermometers, coloured drinking water and edible silver beads were used to mimic Hg spill. Then, using a pre-assembled Hg spill kit, the representatives were taught how to properly manage Hg spillages in various scenarios frequently encountered in MOH healthcare facilities.

At the end of the TOT session, digital handouts

of the lectures and video, and health alert cards featuring information regarding the health effects of Hg exposure, were distributed to the representatives. All materials were prepared in both English and Malay languages. The representatives were then required to train other HCWs and implement the program in all MOH healthcare facilities throughout Selangor and Malacca. Quality control sessions were performed by the research team to ensure the educational program conducted by each representative was consistent, correct and completed.

Assessment Tool

A set of validated, bilingual (English and Malay), self-administered questionnaires was used as a tool to evaluate the HCWs' KABP regarding Hg spillage management. The questionnaire was distributed to the healthcare facilities before and 6 months after the program implementation. Items in the questionnaire were constructed with reference to the contents of the educational program which were mainly based on literatures and the Guidelines on Disposing Mercury Containing Sphygmomanometers and Thermometers in MOH Hospitals (12). During the process of questionnaire development, content validity was established by a jury of seven experts in public health, occupational and environmental health, and health behavioural research. In addition, face validity was conducted with a group of approximately 30 occupational and environmental health officers during a briefing session of this study. To ensure the understanding of the words and sentence constructions, a pre-test and cognitive debriefing session was done with 40 HCWs of similar background to the targeted study population from a hospital in a different state. A pilot test was then done on another 100 HCWs with similar background. Results from the pre-test and pilot test were used to compute the reliability and internal consistency for each domain. Cronbach's alpha coefficients between the two groups tested for knowledge (0.80), attitude (0.77), belief (0.53), and practice (0.63) indicated a moderate to high reliable scale (13).

The questionnaire consisted of five sections; the socio-demographic variables, knowledge, attitude, belief, and practice in relation to Hg spillage management. Items in the knowledge section were designed with the intention of obtaining participants' knowledge on Hg-containing items, routes and health effects of Hg exposure, Hg properties, Hg spillage kit, and on the correct Hg waste management. Items in the practice section were developed with the aim of

assessing participants' practices on handling Hg spillage and disposal of the collected hazardous waste. Whereas items in the attitude and belief sections were developed to assess participants' perspectives and perceptions towards Hg and its spillage management. A range of categorical responses were provided for items in the knowledge and practice sections where participants were required to tick in the boxes with their answers. Whereas items in the attitude and belief sections used a 4-point Likert scale ranging from "strongly disagree" to "strongly agree". A copy of the questionnaire can be found in Appendix 1.

Each correct answer from the knowledge and practice sections received 1 point. For the Attitude and Belief sections, "strongly agree", "agree", "disagree" and "strongly disagree" responses to positively phrased statements received 4, 3, 2, and 1 points respectively. While "strongly agree", "agree", "disagree" and "strongly disagree" responses to negatively phrased statements received 1, 2, 3, and 4 points respectively. Answered questionnaire forms were all inspected for completion by the research team upon return. The blank items were considered a conscious response from the respondent, and were treated as negative responses. Cumulated scores were then categorized into "Good" and "Poor" for each KABP section. Based on the similar study conducted in India, where majority of the respondents scored at least five correct answers over a total of ten questions relating to Biomedical waste management (BMWM), it was decided that a minimum score of 50% was required to be categorized into "Good" levels of KABP (14).

Statistical analysis

Statistical analysis was done using IBM SPSS Statistics for Windows, version 26. Respondents' socio-demography variables were presented as frequencies and percentages. Since responses were unpaired, the association between pre- and post-intervention KABP scores; between good KABP scores and socio-demographic subgroups (i.e. gender, educational qualification, profession, type of health care facility and years of service) were done using Pearson's Chi-square test. Missing data were excluded from the calculations. A 95% level of significance was used throughout the study.

RESULTS

Sociodemographic backgrounds

This study included 441 respondents pre-intervention, and 517 respondents post-intervention; with a response rate of 84.8% and 99.4% respectively. The 82 non respondents comprised those who refused to participate and those who were not present at the time of questionnaire distribution.

The socio-demographic distributions of the respondents observed were similar pre- and post-intervention (Table 1). Approximately three quarter of the respondents were female; 75.2% pre-intervention and 73.7% post-intervention. Majority of the HCWs who participated were nurses; 31.8% pre-intervention and 27.1% post-intervention. A larger portion of respondents were employed in health clinics; 66.1% pre-intervention and 65.0% post-intervention. Most of them had more than 10 years of experience in their service; 35.7% pre-intervention and post-intervention. Majority obtained a diploma; 51.1% pre-intervention and 48.4% post-intervention. Few of the respondents had ever experienced a Hg spillage incident; 15.4% pre-intervention and 14.7% post-intervention.

KABP levels before and after the educational program

Table 2 shows the percentage of "Good" and "Poor" levels for Knowledge, Attitude, Belief and Practice between pre- and post-intervention groups. Total study population showed an increase in Knowledge, Attitude, Belief and Practice scores by 38.3%, 5.7%, 3.2% and 17.2% respectively after the program. However, the improvement in belief among the HCWs after the program was not statistically significant ($p=0.093$).

The association of Good Knowledge, Attitude, Belief and Practice levels with the different socio-demographic variables are shown in Table 3. Good knowledge was significantly associated with profession ($p=0.003$) (Table 3), where an increase of 68.9% hospital attendants (HA), 64.8% midwives (MW) and 63.4% chief medical officers (CMO) had scored good knowledge after the program.

Results also revealed that though there was a significant improvement in respondents' attitude post-intervention ($p=0.001$) (Table 2), it was however, not contributed by their socio-demographic backgrounds ($p=0.50 - 0.795$) (Table 3).

Good belief levels were significantly associated with education ($p=0.028$) and profession ($p=0.017$) (Table 3). An increase of 17.9% of HCWs with the lowest educational level had good knowledge post-intervention as compared to 7.7% decrease among postgraduate

HCWs. Whereas by profession, an increase of 23.2% HA and 10.3% CMO had scored good knowledge post-intervention.

Similarly, the profession of respondents also

significantly influenced the level of good practice ($p=0.048$). It was observed that 38.3% of HA, 36.4% of head nurses, and 33.1% of CMO had improved and scored good practice post-intervention (Table 3).

Table 1. Socio-demography of the study population

Variable	Before Program (N=440)		After Program (N=517)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Gender				
Male	109	24.8	136	26.3
Female	331	75.2	381	73.7
Profession				
Specialist	11	2.5	15	2.9
Chief Medical Officer	7	1.6	25	4.8
Doctor	91	20.7	103	19.9
Head Nurse	39	8.9	30	5.8
Nurse	140	31.8	140	27.1
Medical Assistant	67	15.2	92	17.8
Hospital Attendant	42	9.5	52	10.1
Midwife	43	9.8	60	11.6
Healthcare facility				
Hospital	149	33.9	181	35.0
Health clinic	291	66.1	336	65.0
Years of service				
Less than 1 year	16	3.6	14	2.7
1 to 5 years	142	32.3	156	30.2
6 to 10 years	125	28.4	163	31.6
More than 10 years	157	35.7	184	35.7
Level of education				
High school	82	18.6	88	17.1
Diploma	225	51.1	250	48.4
Undergraduate	115	26.1	143	27.7
Postgraduate	14	3.2	13	2.5
Others	4	0.9	22	4.3
Previous exposure to Hg spillage				
Yes	67	15.4	76	14.7
No	367	84.6	441	85.3

Table 2. Knowledge, Attitude, Belief and Practice levels of the study population before and after the educational program

KABP Level	Before Program (N=441) n (%)	After Program (N=517) n (%)	<i>X² statistic† (df)</i>	<i>p-value</i>
Knowledge				
Good	133 (30.2)	354 (68.5)	139.779 (1)	<0.001*
Poor	308 (69.8)	163 (31.5)		
Attitude				
Good	394 (89.3)	491 (95.0)	10.711 (1)	0.001*
Poor	47 (10.7)	26 (5.0)		
Belief				
Good	394 (89.3)	478 (92.5)	2.824 (1)	0.093
Poor	47 (10.7)	39 (7.5)		
Practice				
Good	258 (58.6)	392 (75.8)	32.221 (1)	<0.001*
Poor	182 (41.4)	125 (24.2)		

n = frequency

df = degree of freedom

† Chi-square test for independence

* significant p-value at 95% confidence interval

KABP levels before and after the educational program

Table 2 shows the percentage of “Good” and “Poor” levels for Knowledge, Attitude, Belief and Practice between pre- and post-intervention groups. Total study population showed an increase in Knowledge, Attitude, Belief and Practice scores by 38.3%, 5.7%, 3.2% and 17.2% respectively after the program. However, the improvement in belief among the HCWs after the program was not statistically significant ($p=0.093$).

The association of Good Knowledge, Attitude, Belief and Practice levels with the different socio-demographic variables are shown in Table 3. Good knowledge was significantly associated with profession ($p=0.003$) (Table 3), where an increase of 68.9% hospital attendants (HA), 64.8% midwives (MW) and 63.4% chief medical officers (CMO) had scored good knowledge after the program.

Results also revealed that though there was a significant improvement in respondents’ attitude post-intervention ($p=0.001$) (Table 2), it was however, not contributed by their socio-demographic backgrounds

($p=0.50 - 0.795$) (Table 3).

Good belief levels were significantly associated with education ($p=0.028$) and profession ($p=0.017$) (Table 3). An increase of 17.9% of HCWs with the lowest educational level had good knowledge post-intervention as compared to 7.7% decrease among postgraduate HCWs. Whereas by profession, an increase of 23.2% HA and 10.3% CMO had scored good knowledge post-intervention.

Similarly, the profession of respondents also significantly influenced the level of good practice ($p=0.048$). It was observed that 38.3% of HA, 36.4% of head nurses, and 33.1% of CMO had improved and scored good practice post-intervention (Table 3).

KABP levels and past experience of Hg spillage incidence

Table 4 shows the results of HCWs with good KABP levels were not influenced by their experience of Hg spillage incidences ($p=0.343$ to 0.975). Majority of HCWs who had scored good KABP levels had no previous experience with Hg spillages, while only less than a quarter (14 – 15%) of HCWs who scored good KABP

Table 3. Good levels of knowledge, attitude, belief and practice before and after the educational program association with respondents' backgrounds

Variable	Good Knowledge				Good Attitude				Good Belief				Good Practice			
	Before n (%)	After n (%)	X ² statistic† (df)	p – value†	Before n (%)	After n (%)	X ² statistic† (df)	p – value†	Before n (%)	After n (%)	X ² statistic† (df)	p – value†	Before n (%)	After n (%)	X ² statistic† (df)	p – value†
Gender																
Male	31 (28.4)	81 (59.6)	0.20 (1)	0.888	97 (89.0)	131 (96.3)	0.455 (1)	0.500	100 (91.7)	128 (94.1)	0.198 (1)	0.656	74 (67.9)	110 (80.9)	0.030 (1)	0.863
Female	101 (30.5)	273 (71.7)			296 (89.4)	360 (94.5)			293 (88.5)	350 (91.9)			184 (55.6)	282 (74.0)		
Education																
High school	14 (17.1)	73 (83.0)	9.436 (4)	0.051	68 (82.9)	81 (92.0)	8.747 (4)	0.068	58 (70.7)	78 (88.6)	10.878 (4)	0.028*	36 (43.9)	67 (76.1)		
Diploma	67 (29.8)	158 (63.2)			205 (91.1)	240 (96.0)			208 (92.4)	229 (91.6)			134 (59.6)	191 (76.4)		
Under-graduate	43 (37.4)	94 (65.7)			102 (88.7)	139 (97.2)			109 (94.8)	138 (96.5)			75 (65.2)	109 (76.2)	4.613 (4)	0.329
Post-graduate	4 (28.6)	7 (53.8)			14 (100.0)	12 (92.3)			14 (100.0)	12 (92.3)			10 (71.4)	12 (92.3)		
Others	4 (100.0)	21 (95.5)			4 (100.0)	19 (86.4)			4 (100.0)	21 (95.5)			3 (75.0)	13 (59.1)		
Profession																
Specialist	4 (36.4)	8 (53.3)	21.259 (7)	0.003*	11 (100.0)	14 (93.3)	11.813 (7)	0.107	11 (100.0)	14 (93.3)	17.132 (7)	0.017*	8 (72.7)	13 (86.7)		
Chief Medical Officer	2 (28.6)	23 (92.0)			7 (100.0)	24 (96.0)			6 (85.7)	24 (96.0)			3 (42.9)	19 (76.0)	14.185 (7)	0.048*

Doctor	37 (40.7)	63 (61.2)			78 (85.7)	101 (98.1)			88 (96.7)	102 (99.0)			65 (71.4)	84 (81.6)		
Head Nurse	12 (30.8)	23 (76.7)			35 (89.7)	29 (96.7)			36 (92.3)	26 (86.7)			17 (43.6)	24 (80.0)		
Nurse	40 (28.6)	85 (60.7)			128 (91.4)	135 (96.4)			128 (91.4)	131 (93.6)			82 (58.6)	99 (70.7)		
Medical Assistant	19 (28.4)	53 (57.6)			62 (92.5)	90 (97.8)			62 (92.5)	82 (89.1)			47 (70.1)	72 (78.3)		
Hospital Attendant	5 (11.9)	42 (80.8)			31 (73.8)	43 (82.7)			25 (59.5)	43 (82.7)			13 (31.0)	36 (69.2)		
Midwife	13 (30.2)	57 (95.0)			41 (95.3)	55 (91.7)			37 (86.0)	56 (93.3)			23 (53.5)	45 (75.0)		
Healthcare facility																
Hospital	34 (22.8)	90 (49.7)	0.006 (1)	0.940	132 (88.6)	169 (93.4)	0.067 (1)	0.795	132 (88.6)	160 (88.4)	0.001 (1)	0.971	88 (59.1)	130 (71.8)	0.062 (1)	0.803
Health Clinic	98 (33.7)	264 (78.6)			261 (89.7)	322 (95.8)			261 (89.7)	318 (94.6)			170 (58.4)	262 (78.0)		
Years of service																
Less than 1 year	2 (12.5)	6 (42.9)	0.319 (3)	0.956	15 (93.8)	13 (92.9)	2.123 (3)	0.547	14 (87.5)	13 (92.9)	2.137 (3)	0.544	12 (75.0)	11 (78.6)		
1 to 5 years	39 (27.5)	102 (65.4)			126 (88.7)	150 (96.2)			128 (90.1)	148 (94.9)			82 (57.7)	119 (76.3)	1.920 (3)	0.589
6 to 10 years	44 (35.2)	111 (68.1)			109 (87.2)	154 (94.5)			110 (88.0)	154 (94.5)			78 (62.4)	128 (78.5)		
More than 10 years	47 (29.9)	135 (73.4)			143 (91.1)	174 (94.6)			141 (89.8)	163 (88.6)			86 (54.8)	134 (72.8)		

n = frequency

df = degree of freedom

† Chi-square test for independence

* significant p-value at 95% confidence interval

Table 4. Previous experience of mercury spillage incidence association with good Knowledge, Attitude, Belief and Practice levels (N=958)

KABP Level	N	Previously experienced a mercury spillage incidence		X2 statistic† (df)	p-value†
		Yes n (%)	No n (%)		
Good Knowledge	487	68 (14)	419 (86.0)	0.901 (1)	0.343
Good Attitude	882	132 (15.0)	750 (85.0)	0.048 (1)	0.827
Good Belief	871	130 (14.9)	741 (85.1)	0.101 (1)	0.751
Good Practice	650	97 (14.9)	553 (85.1)	0.001 (1)	0.975

N = sample size

n = frequency

df = degree of freedom

† Chi-square test for independence

* significant p-value at 95% confidence interval

levels had actually experienced a Hg spillage incident.

DISCUSSION

Our study observed an unsatisfactory baseline level of knowledge on Hg and its spillage management among the HCWs. This finding reflects a lack of fundamental knowledge of the HCWs prior to the educational program. Hence, it suggests the need for an improved training method, as the first step in the prevention and minimisation of risks associated with occupational hazards.

To date, there are no published KABP studies that evaluate the impact of education on hazardous waste management in Malaysia. Our study implemented an educational program in the form of lectures, video demonstration, and simulation training; then assessed its impact on HCWs KABP scores regarding Hg spillage management. The HCWs showed a significant increase in their knowledge, attitude and practice (KAP) levels after the program. Our results were consistent with other studies which also demonstrated a positive impact of the health education intervention on KAP scores regarding waste management (14-16).

In India, it was reported that a training module had effectively elevated the KAP score on BMWM among nurses. This was evident with an improvement of both average and good knowledge among the nurses at 47.2% and 52.8%; respectively upon training. The comparison was made against the observation of 78.4%, 11.3% and 10.3% of nurses that portrayed average, good and poor knowledge prior to training exposure (14).

Another study in India found that a sensitisation program and new waste management rules regarding BMWM had also effectively improved the KAP score of

HCWs. Almost half (42%) had poor KAP scores, 59% scored average and only 2% scored good KAP before the intervention. After the intervention, KAP scores were observed to be elevated where 71% scored average, 21% good and 11% poor KAP (15).

Additionally, results from another similar study in Egypt have also shown that educational and training programs were effective in improving the KAP on medical waste management among HCWs in a university hospital. The program was proven to adequately improve the KAP among physicians, nurses and auxiliary workers by approximately 52.8% to 58.4%, 34.04% to 48.5% and 50.0 to 51.5%, respectively (16).

The findings of our study have also revealed that although there was an improvement in belief among the HCWs post-intervention, it was not statistically significant ($p=0.093$). This is perhaps in relevance to the strong beliefs among the HCWs prior to the intervention itself. Likewise, several other studies have also found that established positive beliefs pre-intervention did not change significantly post-intervention (17,18).

A study on the effects of educational and feedback interventions on recycling knowledge, attitudes, beliefs, and behaviours among students in University of Michigan have shown that beliefs on recycling behaviour between the intervention and control group of students was not significantly different ($F=1.91$, $p=0.13$) (17). The study reported that the finding was probably due to the students already had a pro-environmental stance and held positive beliefs on recycling even prior to the intervention (17).

Similarly, another study conducted among university students in Midwest of the United States

found that written messages did not have a significant influence on the students' beliefs toward food waste and sustainability (18). The study observed constant beliefs among the students throughout the study duration, reckoning that they already had positive baseline beliefs toward sustainability and opposition to food waste; therefore, it was expected that their positive beliefs did not change significantly (18).

Beliefs are ideas that are held to be true; developed from what is seen, heard, experienced, read and thought about (19). With this in view, it could be presumed that the foundation of the HCWs belief in our study was potentially contributed by the media. It was worthwhile to note that, there was a sporadic increase in media coverage of Hg spillage incidents in Malaysia within the year 2016 to 2017, leading to numerous news coverages on Hg spill incidences in healthcare facilities (20,21), schools (22,23), colleges (24,25), as well as private residences (26).

A study on the effects of news media coverage on population beliefs about the association between smoking and health provide support on this aspect. The study noted an increasing number of articles on smoking and health from 1950s to 1980s; from less than 20 to more than 70 articles per year. Following the media coverage trend, less than half of the population believed that smoking caused lung cancer in the 1950s, and this perception substantially increased to over 90% by the early 1980s. Additionally, the percentage of population that believed smoking is hazardous to non-smokers' health was also increased from less than 50% in 1974 to 70% in 1980s (27).

Additionally, our study also found no evidence of HCWs' past experience of Hg spillage incidents having an influence on their KABP levels. Similarly, another local study investigating the predictors for good knowledge regarding mercury hygiene among HCWs also discovered that, among the respondents who had good knowledge, only 14.6% (n=63) had previous exposure to Hg spillage. Additionally, the study found that only 8.1% of the respondents had ever cleaned a Hg spillage, and just 2.3% had supervised the clean-up process (28). This suggests that HCWs who have been exposed to a Hg spillage incident may not necessarily involve in the decontamination process. They may have not given much attention to the potential hazards and the cleaning procedure, hence unaffacting their KABP levels on Hg hygiene.

CONCLUSION

Our study highlighted significant improvement in the HCWs knowledge, attitude and practice levels upon the program implementation that emphasized the need for HCWs to attend more educational opportunities to update their knowledge and strengthen their skills. The design of our program which included theoretical lectures, visual-based learning through videos and simulation training, has shown that HCWs could indeed improve their competencies in Hg spillage management. Therefore, the practical and engaging approach of our program could be proposed to health policy makers and authorities for replication in other healthcare facilities. Nevertheless, our study had some methodological limitations. Since the responses were kept anonymous, it was not possible to conduct samples pairing before and after the program; as well as the long-term impact could not be concluded with lack of follow-up measures with the respondents. As with any other survey studies, the findings from our study can only be considered descriptive and hypothesis-generating.

ETHICAL APPROVAL

Ethical approvals were obtained from the Medical Research and Ethics Committee Malaysia with reference numbers (5) KKM/NIHSEC/P-17-1040 and KKM.NIHSEC.P17-1040(7).

CONFLICTS OF INTERESTS

The authors have no conflicts of interest with the materials presented in this paper.

ACKNOWLEDGEMENTS

Authors would like to thank the Director General of Health Malaysia for his permission to publish this article and all the representatives from the participating healthcare facilities for their dedication in conducting the intervention program. Authors also acknowledge Taman Medan Health Clinic staffs for their contribution in the development of the video demonstration. Authors also thank Dr. Siti Aisyah Salahudin and Dr. Siti Hajar Shahrudin for helping with the initial editing of the study proposal. This study was financially supported by the Ministry of Health Malaysia Research Grant (MRG) with the National Medical Research Register code NMRR-17-517-35301.

REFERENCES

1. Zeitz P, Orr MF, Kaye WE. Public health consequences of mercury spills: Hazardous

- Substances Emergency Events Surveillance system, 1993-1998. *Environmental Health Perspectives*. 2002 ;110(2):129–32. doi.org/10.1289/ehp.02110129
2. Rennie AC, McGregor-Schuerman M, Dale IM, Robinson C, McWilliam R. Lesson of the week: Mercury poisoning after spillage at home from a sphygmomanometer on loan from hospital. *BMJ*. 1999;319(7206):366–7. doi.org/10.1136/bmj.319.7206.366
 3. Duncan A, O'Reilly DStJ, McDonald EB, Watkins TR, Taylor M. Thirty-five year review of a mercury monitoring service for Scottish dental practices. *British Dental Journal*. 2011;210(3):E2–2. doi.org/10.1038/sj.bdj.2011.49
 4. Baughman TA. Elemental Mercury Spills. *Environmental Health Perspectives*. 2006;114(2):147–52. doi.org/10.1289/ehp.7048
 5. ATSDR. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury. Agency for Toxic Substances and Disease Registry. Agency for Toxic Substances and Disease Registry. 1999;
 6. Clarkson TW. Mercury. *J Am Coll Toxicol*. 1989;8(7):1291–5.
 7. Bose-O'Reilly S, McCarty KM, Steckling N, Lettmeier B. Mercury Exposure and Children's Health. *Current Problems in Pediatric and Adolescent Health Care* [Internet]. 2010;40(8):186–215. doi.org/10.1016/j.cpped.2010.07.002
 8. Ministry of Health. Laporan Tahunan Kementerian Kesihatan Malaysia. 2018.
 9. Kumar R, Somrongthong R, Shaikh BT. Effectiveness of intensive healthcare waste management training model among health professionals at teaching hospitals of Pakistan: a quasi-experimental study. *BMC Health Services Research*. 2015;15(1). doi.org/10.1186/s12913-015-0758-7
 10. Roslan J, Noor Hazilah A, Nor Filzatun B, Azahadi M. Turnover Intention among Public Sector Health Workforce: Is Job Satisfaction the Issue? *IJUM Medical Journal Malaysia*. 2020;13(1). doi.org/10.31436/ijum.v13i1.492
 11. Haynie WJ. Effects of Anticipation of Test on Delayed Retention Learning. *Journal of Technology Education*. 1997;9(1). doi.org/10.21061/jte.v9i1.a.2
 12. Ministry of Health. Garis Panduan Pelupusan Termometer Dan Sphygmomanometer Yang Mengandung Merkuri Di Fasilitas Kesihatan, Kementerian Kesihatan Malaysia. 2016.
 13. Hinton PR, Brownlow C, McMurray I, Cozens B. *SPSS Explained*. London and New York: Routledge Taylor & Francis Group. 2004;363–4. doi.org/10.4324/9781315797298
 14. Imtiaz D, Gupta S, Singh J, Shrotriya V, Malik SB. Assessment of Knowledge of Hospital Staff Regarding Biomedical Waste Management in a Tertiary Care Hospital in Uttar Pradesh. *Sch J Appl Med Sci Sch J App Med Sci*. 2014;2(3C):1070–4.
 15. Arthi M, Surendar R, Srikanth S, Latha S, Radhika. Bio-Medical Waste Management Rules 2016. Are The Health Care Workers Aware? – Evaluation of An Intervention. *International Journal of Medical and Biomedical Studies*. 2019;3(4). doi.org/10.32553/ijmbs.v3i4.183
 16. El-Naggar S, Abass R, El-Gohary S, Bolbol S, Abd-El-Azem W. Medical Waste Management Educational and Training Intervention Program in Zagazig University Hospitals. *Egyptian Journal of Occupational Medicine*. 2017;41(3):459–74. doi.org/10.21608/ejom.2017.3932
 17. Goldenhar LM, Connell CM. Effects of Educational and Feedback Interventions on Recycling Knowledge, Attitudes, Beliefs, and Behaviors. *Journal of Environmental Systems*. 2005;21(4):321–33. doi.org/10.2190/0hc1-ugml-97n6-upfe
 18. Whitehair KJ, Shanklin CW, Brannon LA. Written Messages Improve Edible Food Waste Behaviors in a University Dining Facility. *Journal of the Academy of Nutrition and Dietetics*. 2013;113(1):63–9. doi.org/10.1016/j.jand.2012.09.015
 19. Webster M. Definition of BELIEF [Internet]. Merriam-webster.com. 2020. Available from: <https://www.merriam-webster.com/dictionary/belief>
 20. Raksa tumpah di wad Wanita [Internet]. *Harian Metro*; 2016. Available from: <https://www.hmetro.com.my/node/182781>
 21. Berita Harian. Tumpahan merkuri di klinik, jururawat terpaksa dimandikan [Internet]. *Berita Harian*; 2017. Available from: <https://www.bharian.com.my/node/271609>
 22. Auto H. Students in Malaysia bring Mercury to School in Plastic Bag, Forcing 56 to be Quarantined | *The Straits Times* [Internet]. www.straitstimes.com. 2016 [cited 2022 Dec 14]. Available from: <https://www.straitstimes.com/asia/se-asia/students-in-malaysia-bring-mercury-to-school-in-plastic-bag-forcing-56-to-be>
 23. Mahorm S. Second Case of Mercury Spill in School Lab [Internet]. *The Star*. 2020 [cited 2022 Dec 14]. Available from: <https://www.thestar.com.my/news/nation/2017/02/23/second-case-of-mercury-spill-at->

school-lab/

24. Astro Awani. Panic at UIA medical faculty after mercury spill. Astro Awani [Internet]. 2016; Available from: english.astroawani.com/malaysia-news/panic-uia-medical-faculty-after-mercury-spill-121091
25. BPK) SS (Seksyen KS. Tumpahan Merkuri, IPB Ikut SOP [Internet]. www.ums.edu.my. 2020 [cited 2022 Dec 14]. Available from: <https://www.ums.edu.my/v5/index.php/ms/banner-link/5794-tumpahan-merkuri-ipb-ikut-sop>
26. Then S. Hazmat Team Moves Fast to Save Dad and Daughter from Mercury Spill [Internet]. The Star. 2020 [cited 2022 Dec 14]. Available from: <https://www.thestar.com.my/news/nation/2017/03/19/hazmat-team-moves-fast-to-save-dad-and-daughter-from-mercury-spill/>
27. Pierce JP, Gilpin EA. News Media Coverage of Smoking and Health is Associated with Changes in Population Rates of Smoking Cessation But Not Initiation. *Tobacco Control*. 2001;10(2):145–53. doi.org/10.1136/tc.10.2.145
28. Mohd Zainee ZH, Saliluddin SM. Predictors for Good Knowledge Regarding Mercury Hygiene Among Primary Healthcare Workers in Seremban, Negeri Sembilan. *Int J Public Heal Clin Sci*. 2017;4(5):182–98.

BORANG SOAL SELIDIK
QUESTIONNAIRE FORM

PENILAIAN TAHAP PENGETAHUAN, SIKAP, KEPERCAYAAN DAN
AMALAN PENGURUSAN TUMPAHAN MERKURI/RAKSA DALAM
KALANGAN PEKERJA FASILITI KESIHATAN
KEMENTERIAN KESIHATAN MALAYSIA

*ASSESSMENT OF KNOWLEDGE, ATTITUDE, BELIEF
AND PRACTICE ON MANAGEMENT OF MERCURY
SPILLAGE AMONG HEALTHCARE WORKERS IN
MINISTRY OF HEALTH MALAYSIA*

ID:



















Tandakan ✓ pada maklumat anda di bawah:
Tick ✓ in your details below:

DATA SOSIODEMOGRAFI		
Jantina : <i>Gender</i>	<input type="checkbox"/> Lelaki	<input type="checkbox"/> Perempuan <i>Female</i>
Taraf pendidikan yang tertinggi : <i>Highest Educational Qualification :</i>	<input type="checkbox"/> PMR/SPM/STP <input type="checkbox"/> M <input type="checkbox"/> Diploma <input type="checkbox"/> Sarjana/ PhD <i>Master/ PhD</i>	<input type="checkbox"/> Ijazah <i>Degree</i> <input type="checkbox"/> Lain-lain (sila nyatakan) : <i>Others (please specify):</i> _____
Jawatan : <i>Profession</i>	<input type="checkbox"/> Pakar/ konsultan <i>Specialist</i> <input type="checkbox"/> Pegawai Perubatan <i>Doctor</i> <input type="checkbox"/> Pegawai Perubatan Pentadbir Klinik Kesihatan <i>Chief Medical Officer in Health Clinic</i> <input type="checkbox"/> Pembantu Perawatan Kesihatan <i>Hospital Attendant</i>	<input type="checkbox"/> Ketua jururawat/ Matron <i>Head Nurse</i> <input type="checkbox"/> Jururawat <i>Nurse</i> <input type="checkbox"/> Penolong Pegawai Perubatan <i>Medical Assistant</i> <input type="checkbox"/> Jururawat Masyarakat <i>Midwife</i>
Fasiliti kesihatan : <i>Healthcare facility</i>	<input type="checkbox"/> Hospital <i>Hospital</i>	<input type="checkbox"/> Klinik Kesihatan
Tahun berkhidmat: <i>Years of service:</i>	<input type="checkbox"/> Kurang daripada 1 tahun <i>Less than 1 year</i> <input type="checkbox"/> 1-5 tahun <i>1-5 years</i>	<input type="checkbox"/> lebih daripada 5 tahun, sehingga ke 10 tahun <i>more than 5 years, up to 10 years</i> <input type="checkbox"/> lebih daripada 10 tahun <i>more than 10 years</i>

PENGETAHUAN
KNOWLEDGE

Sila tandakan ✓ pada pilihan jawapan anda. Anda boleh pilih lebih daripada 1 jawapan.
Please tick ✓ to your answers for the following questions. You may choose more than 1 answer.

SOALAN QUESTIONS	JAWAPAN ANSWER
<p>1. Tandakan ✓ pada alat-alat yang mengandungi merkuri/raksa. <i>Tick ✓ to items that contain mercury.</i></p> <ul style="list-style-type: none"> • Termometer kaca <i>Glass thermometer</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Bateri alkali <i>Alkaline Batteries</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Mentol lampu kalimantang <i>Fluorescent bulbs</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Set tekanan darah digital <i>Digital blood pressure set</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Set tekanan darah manual <i>Manual blood pressure set</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Termometer digital <i>Digital thermometer</i> 	<input type="checkbox"/>
<p>2. Tandakan ✓ pada kesan-kesan buruk merkuri/raksa terhadap kesihatan. <i>Tick ✓ to the adverse health effects of mercury.</i></p> <ul style="list-style-type: none"> • Gangguan saraf <i>Neurological impairment</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Demam <i>Fever</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Sesak nafas <i>Shortness of breath</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Muntah <i>Vomiting</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Ruam kulit <i>Skin rashes</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Kematian <i>Death</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Kecacatan janin <i>Birth defects</i> 	<input type="checkbox"/>
<p>3. Tandakan ✓ pada cara-cara yang boleh menyebabkan merkuri/raksa masuk ke dalam tubuh badan. <i>Tick ✓ to the possible ways for mercury to enter the body.</i></p> <ul style="list-style-type: none"> • Sentuhan kulit <i>Skin contact</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Menelan <i>Ingestion</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Pernafasan <i>Inhalation</i> 	<input type="checkbox"/>

<p>4. Tandakan ✓ pada sifat-sifat merkuri/raksa. <i>Tick ✓ to the natures of mercury.</i></p> <ul style="list-style-type: none">• Merkuri/raksa boleh wujud dalam bentuk pepejal pada suhu bilik. <i>Mercury can form into solid at room temperature.</i>	<input type="checkbox"/>												
<ul style="list-style-type: none">• Merkuri/raksa mempunyai bau. <i>Mercury has smell.</i>	<input type="checkbox"/>												
<ul style="list-style-type: none">• Merkuri/raksa boleh melekat pada pakaian dan kasut. <i>Mercury can adhere to clothes and shoes.</i>	<input type="checkbox"/>												
<ul style="list-style-type: none">• Merkuri/raksa yang tertumpah akan meruap ke udara pada suhu bilik. <i>Spilt mercury may vaporize into air at room temperature.</i>	<input type="checkbox"/>												
<p>5. Adakah merkuri/raksa sejenis sisa kimia berjadual? <i>Is mercury a type of scheduled waste?</i></p>	<input type="checkbox"/> Ya Yes <input type="checkbox"/> Tidak No												
<p>6. Tumpahan merkuri/raksa yang telah dikumpulkan perlu dilupuskan dalam masa 6 bulan. <i>Spilt mercury that is collected must be disposed within 6 months.</i></p>	<input type="checkbox"/> Ya Yes <input type="checkbox"/> Tidak No												
<p>7. Pilih SATU SAHAJA simbol untuk sisa tumpahan merkuri/raksa. <i>Choose ONLY ONE symbol for mercury waste.</i></p> <table border="0" data-bbox="269 1444 1123 1961"><tr><td></td><td><input type="checkbox"/></td><td></td><td><input type="checkbox"/></td></tr><tr><td></td><td><input type="checkbox"/></td><td></td><td><input type="checkbox"/></td></tr><tr><td></td><td><input type="checkbox"/></td><td></td><td><input type="checkbox"/></td></tr></table>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>										
	<input type="checkbox"/>		<input type="checkbox"/>										
	<input type="checkbox"/>		<input type="checkbox"/>										

<p>8. Tandakan ✓ pada item-item yang boleh anda dapati dalam kit tumpahan merkuri/raksa. <i>Tick ✓ to the items that you may find inside a mercury spill kit.</i></p> <ul style="list-style-type: none"> • Lampu suluh <i>Torchlight</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Kadbod <i>Cardboard</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Pita selofan <i>Cellophane tape</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Forseps pembedahan <i>Surgical forceps</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Forseps pakai buang <i>Disposable forceps</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Pipet/ picagari pakai buang <i>Disposable pipette/syringe</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Bekas kedap udara dan kalis pecah <i>Air- tight and shatter- proof container</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Apron plastic pakai buang <i>Disposable plastic apron</i> 	<input type="checkbox"/>
<p>9. Tumpahan merkuri/raksa boleh dibersihkan dengan menggunakan penyapu lantai. <i>Mercury spills can be cleaned up using a sweeping broom.</i></p>	<input type="checkbox"/> Ya <i>Yes</i> <input type="checkbox"/> Tidak <i>No</i>
<p>10. Tumpahan merkuri/raksa daripada sebatang thermometer yang pecah adalah tumpahan kecil. <i>Mercury spill from one broken thermometer is considered a small spill.</i></p>	<input type="checkbox"/> Ya <i>Yes</i> <input type="checkbox"/> Tidak <i>No</i>
<p>11. Adakah anda mengetahui tentang garis panduan berkenaan pengurusan tumpahan merkuri/raksa yang dikeluarkan oleh Kementerian Kesihatan Malaysia? <i>Are you aware of the guideline on mercury spillage management by the Ministry of Health Malaysia?</i></p>	<input type="checkbox"/> Ya (sila jawab soalan 12) <i>Yes (please answer question 12)</i> <input type="checkbox"/> Tidak (sila ke bahagian Sikap) <i>No (proceed to Attitude section)</i>
<p>12. Pernahkah anda membaca garis panduan tersebut? <i>Have you ever read the guideline?</i></p>	<input type="checkbox"/> Ya <i>Yes</i> <input type="checkbox"/> Tidak <i>No</i>

SIKAP
ATTITUDE

Sila nyatakan tahap persetujuan anda dengan setiap kenyataan berikut dengan **membulatkan SATU NOMBOR** daripada skala 1 hingga 4 seperti di bawah :

Please indicate your level of agreement with each of the following statements by circling ONE NUMBER from the scale of 1 to 4 as listed below:

1	2	3	4
Sangat tidak setuju <i>Strongly disagree</i>	Tidak setuju <i>Disagree</i>	Setuju <i>Agree</i>	Sangat setuju <i>Strongly agree</i>

KENYATAAN STATEMENT	JAWAPAN ANSWER			
1. Saya memerlukan latihan pengurusan tumpahan merkuri/raksa. <i>I need training on mercury spillage management.</i>	1	2	3	4
2. Saya akan membuka tingkap semasa mengendalikan tumpahan merkuri/raksa. <i>I will open the windows while handling mercury spillage.</i>	1	2	3	4
3. Saya perlu memakai alat perlindungan diri (PPE) yang bersesuaian ketika mengendalikan tumpahan merkuri/raksa. <i>I need to wear appropriate personal protective equipment (PPE) while handling mercury spill.</i>	1	2	3	4
4. Jika berlaku tumpahan merkuri/raksa di tempat kerja saya pada hari ini, saya boleh membersihkannya pada hari berikutnya <i>If there is a mercury spillage at my workplace today, I can clean it the next day</i>	1	2	3	4
5. Saya perlu meminta bantuan pasukan bahan merbahaya (HAZMAT) untuk mengendalikan tumpahan besar. <i>I need to call for hazardous material team (HAZMAT) to handle large spills.</i>	1	2	3	4

KEPERCAYAAN
BELIEF

Sila nyatakan tahap persetujuan anda dengan setiap kenyataan berikut dengan membulatkan **SATU NOMBOR** daripada skala 1 hingga 4 seperti di bawah :

Please indicate your level of agreement with each of the following statements by circling ONE NUMBER from the scale 1 to 4 as listed below:

1	2	3	4
Sangat tidak setuju <i>Strongly disagree</i>	Tidak setuju <i>Disagree</i>	Setuju <i>Agree</i>	Sangat setuju <i>Strongly agree</i>

SOALAN <i>QUESTION</i>	JAWAPAN <i>ANSWER</i>			
1. Saya tidak percaya bahawa merkuri/raksa yang tertumpah boleh meresap ke dalam tubuh. <i>I do not believe that spilt mercury can be absorbed into the body.</i>	1	2	3	4
2. Saya percaya bahawa pendedahan langsung kepada merkuri/raksa boleh menyebabkan kecacatan kepada janin dalam kandungan. <i>I believe that direct exposure to mercury can cause fetal deformities.</i>	1	2	3	4
3. Saya tidak percaya bahawa merkuri/raksa yang tertumpah akan mencemarkan alam sekitar. <i>I do not believe that spilt mercury will pollute the environment.</i>	1	2	3	4
4. Saya percaya bahawa merkuri/raksa yang tertumpah dan tidak diuruskan dengan baik boleh membahayakan kesihatan. <i>I believe that spilt mercury that is not properly managed can be harmful to health.</i>	1	2	3	4
5. Saya percaya dengan memakai alat perlindungan diri (PPE) ketika mengendalikan tumpahan merkuri/raksa, ia dapat mengelakkan kesan buruk merkuri/raksa terhadap kesihatan. <i>I believe by wearing personal protective equipment (PPE) while handling spilt mercury will prevent adverse health effects of mercury.</i>	1	2	3	4

AMALAN
PRACTICE

Sila tandakan ✓ pada pilihan jawapan anda. Anda boleh pilih lebih daripada 1 jawapan.
Please tick ✓ to your answers for the following questions. You may choose more than 1 answer.

QUESTION	RESPOND
<p>1. Pernahkah anda berdepan dengan situasi tumpahan merkuri/raksa di tempat kerja anda? <i>Have you ever encountered a spilt mercury event in your workplace?</i></p>	<p><input type="checkbox"/> Ya Yes</p> <p><input type="checkbox"/> Tidak No</p>
<p>2. Pernahkah anda menerima sebarang latihan dalam pengurusan tumpahan merkuri? <i>Have you ever received any training on mercury spillage management?</i></p>	<p><input type="checkbox"/> Ya Yes</p> <p><input type="checkbox"/> Tidak No</p>
<p>3. Alat perlindungan diri (PPE) manakah yang anda akan gunakan semasa menguruskan tumpahan merkuri/raksa? <i>Which of the following personal protective equipments (PPE) would you use while cleaning spilt mercury?</i></p>	
<ul style="list-style-type: none"> • Sarung tangan getah <i>Latex gloves</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Topeng muka pembedahan <i>Surgical mask</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Topeng muka R95 <i>R95 mask</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Gogel <i>Goggles</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Gaun pakai buang <i>Disposable gown</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Penutup kasut pakai buang <i>Disposable shoe cover</i> 	<input type="checkbox"/>
<p>4. Apakah yang anda lakukan kepada sisa tumpahan merkuri/raksa setelah dikumpulkan? <i>What would you do to the collected spilt mercury?</i></p>	
<ul style="list-style-type: none"> • Melabel bekas sisa tumpahan merkuri/raksa tersebut dengan maklumat yang lengkap. <i>Label the spilt mercury container with complete information.</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Membuang sisa tumpahan merkuri tersebut ke dalam tong sampah klinikal. <i>Dispose the spilt mercury into the clinical waste bin.</i> 	<input type="checkbox"/>

<p>5. Dimanakah anda akan melupuskan sisa tumpahan merkuri/raksa yang telah dikumpulkan? <i>Where will you dispose the collected spilt mercury?</i></p> <ul style="list-style-type: none"> • Sinki <i>Sink</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Tong sisa klinikal <i>Clinical waste bin</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Tong sampah biasa <i>Domestic waste bin</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Tong buangan bahan tajam <i>Sharps bin</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Tempat pengumpulan sisa berjadual <i>Scheduled waste collection area</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Lain-lain, sila nyatakan : <i>Others, please specify :</i> 	<p>_____ <input type="checkbox"/></p>
<p>6. Apakah yang anda lakukan jika berlaku tumpahan merkuri/raksa daripada satu set tekanan darah manual yang pecah? <i>What would you do if there is spilt mercury from a broken manual blood pressure set?</i></p> <ul style="list-style-type: none"> • Membersihkan sendiri tumpahan tersebut <i>Clean the spilt mercury myself</i> 	<input type="checkbox"/>
<ul style="list-style-type: none"> • Meminta pertolongan pasukan Bomba dan Penyelamat untuk membersihkan tumpahan tersebut. <i>Ask for help from the Fire and Rescue Department to clean the spill.</i> 	<input type="checkbox"/>
<p>7. Apabila berlaku tumpahan merkuri/raksa dari sebatang thermometer yang pecah, saya tidak perlu memanggil pasukan Bomba dan Penyelamat untuk membersihkannya. <i>When there is mercury spillage from a broken thermometer, I don't have to call the Fire and Rescue Department to clean it up.</i></p>	<p><input type="checkbox"/> Ya Yes</p> <p><input type="checkbox"/> Tidak No</p>
<p>8. Membersihkan tumpahan merkuri/raksa menggunakan penyapu lantai boleh meningkatkan risiko kesihatan dan tahap pendedahan kepada merkuri/raksa. <i>Cleaning mercury spills using a sweeping broom may increase health risks and levels of exposure to mercury.</i></p>	<p><input type="checkbox"/> Ya Yes</p> <p><input type="checkbox"/> Tidak No</p>

<p>* Sila jawab soalan ini sekiranya anda seorang Pegawai Perubatan Pentadbir Klinik Kesihatan / Ketua Jururawat/ Matron: * <i>Please answer this question if you are the Medical Officer In-charge in Health Clinic/Sister/Matron:</i></p> <p>9. Apabila berlaku tumpahan merkuri/raksa, saya akan membuat notifikasi kejadian menggunakan borang-borang berikut: <i>When there is a mercury spillage event, I will notify the incident using the following forms:</i></p> <ul style="list-style-type: none">• WEHU A1/A2 (JKKP 6)	<input type="checkbox"/>
<ul style="list-style-type: none">• WEHU D1/D2 (JKKP 7)	<input type="checkbox"/>
<ul style="list-style-type: none">• WEHU E1/E2 (JKKP 7)	<input type="checkbox"/>

TAMAT SOAL SELIDIK
Terima Kasih Kerana Mengambil Bahagian
Dalam Penyelidikan Kami

END OF QUESTIONNAIRE
Thank You for Taking Part in Our Research