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EDITORIAL

GENDER DIFFERENCE IN SAFE AND UNSAFE PRACTICE OF PESTICIDE HANDLING IN TOBACCO FARMERS OF MALAYSIA

Rusli BIN NORDIN, Shunichi ARAKI, Hajime SATO, Kazuhito YOKOYAMA, Wan Abdul Manan BIN WAN MUDA* and Daw WIN KYI*

Department of Public Health and Occupational Medicine, Graduate School of Medicine, Faculty of Medicine, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

***Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia**

To identify gender difference in safe and unsafe practice of pesticide handling in tobacco farmers of Malaysia, we conducted a 20-item questionnaire interview on storage of pesticide (4 questions), mixing of pesticide (3 questions), use of personal protective equipment and clothing while spraying pesticide (7 questions), activities during and after spraying of pesticide (5 questions), and maintenance of pesticide sprayer (1 question) in 496 tobacco farmers (395 males and 101 females) in Bachok District, Kelantan, Malaysia. Duration of employment was significantly longer in females than those in males ($p<0.001$). In addition, proportion with no formal education in females was significantly higher than those in males ($p<0.05$). The following eight common factors were extracted from the 20 questionnaires by principal components factor analysis after varimax rotation in all farmers: (1) use of personal protective equipment, (2) unsafe work habit, (3) reading and following instructions on pesticide label, (4) security, storage and disposal of pesticide container, (5) safe work habit, (6) proper handling of pesticide and maintenance of pesticide sprayer, (7) use of personal protective clothing, and (8) safe handling of pesticide. Results of analysis of covariance for the eight factor scores of all male and female farmers, controlling for educational level and duration of employment, showed that: (1) factor scores for use of personal protective equipment ($p<0.001$), use of personal protective clothing ($p<0.001$) and safe work habit ($p<0.001$) in females were significantly lower than those in males; (2) conversely, factor scores for reading and following instruction on pesticide label ($p<0.001$) and proper handling of pesticide and maintenance of pesticide sprayer ($p<0.01$) in males were significantly lower than those in females; and (3) there were no significant differences in other three factor scores ($p>0.05$). We therefore conclude that: (1) for female tobacco farmers, choice of personal attire tend to result in lower scores on use of personal protective equipment and personal protective clothing while personal hygiene practices result in lower score on safe work habit; and, (2) for male tobacco farmers, the lower scores on reading and following instruction on pesticide label and mixing pesticide and maintenance of pesticide sprayer in good condition suggests that they were not primarily involved in these activities. It is postulated that these differences in safe and unsafe practices of pesticide handling across gender is related to the choice of personal attire, personal hygiene practices and division of labour within farming households which in turn is influenced by prevailing sociocultural norms in the community.

Key words : *Gender difference, Safe and unsafe practice of pesticide handling, Tobacco farmers, Malaysia*

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Introduction

Acute and chronic effects of occupational exposure to organophosphorus pesticides have been well documented.(1-12) These exposures have been partly explained by unsafe work practice and habits of pesticide handling especially in farmers in developing countries.(13-20) Occupational exposure to pesticides could occur at the following handling of pesticides: purchase, transportation, storage, retrieval, mixing, loading, spraying, disposal of used container, and care of pesticide sprayer. Exposure could also occur from misuse of protective equipment and clothing; unsafe work habit such as drinking, eating, and smoking while working; and lack of personal hygiene. In addition, enforcement of occupational health and safety legislation, prevailing custom and tradition, and climatic, socio-economic, demographic and other local factors have substantial effects on the extent of occupational exposure to pesticides.(3)

Studies focussing on gender inequality in access to safe working environments in developing countries (21-26) have indicated that prevailing local work policies ultimately forced female workers, who were burdened with domestic chores and poor health status, into jobs which are of lower status, lower pay but heavier in physical demands and more hazardous work exposures compared to their male counterparts. It has been postulated that female workers were more susceptible to acute and chronic effects of chemicals, stresses and injuries because of greater exposure to more hazardous chemical, psychological and physical work environments. (21-26)

Previous reports on pesticide toxicity in tobacco farmers in Malaysia revealed that more than one third experienced acute symptoms.(13-15) These reports indicated the extent of unsafe practices of pesticide handling in tobacco farmers without identifying gender differences in safe and unsafe work habits. To the best of our knowledge, there has been no report of any real difference in occupational health hazards across genders in

Table 1 : Sociodemographic Variables of 395 Male and 101 Female Tobacco Farmers in Bachok District, Kelantan, Malaysia

Variables	Males			Females			*P* †
	Mean	Range	No.(%)	Mean	Range	No.(%)	
Age (years)	43	15-84		43	17-80		NS
Marital Status							NS
Married			346(88)			89(88)	
Not Married			49(12)			12(12)	
Educational Level							< 0.05
None (0 year)			129(33)			47(47)	
Primary (6 years)			195(49)			44(44)	
Secondary (11 years)			71(18)			10(10)	
Occupational Status							NS
Work on Own Farm			284(72)			78(77)	
Work on Rented Farm			111(28)			23(23)	
Duration of Employment (years)	9	0-30		12	0-30		< 0.001
Annual Household Income (Ringgit Malaysia)	4154	1000-26,400		3974	1000-17,400		NS
Smoking Status							NS
Smoker			299(76)			15(15)	
Non-Smoker			96(24)			86(85)	

† Significance for gender difference (χ^2 test for marital status, educational level, occupational status, and smoking status; *t* test for all others)
NS: *P* > 0.05

TABLE 2: Correlation Matrix of 20 Variables of Safe and Unsafe Practices of PesticideHandling: Pearson's Product Moment Correlation Coefficients

Variables†	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Storage of Pesticide																				
1. Do you usually lock pesticide container?	1.000																			
2. Do you usually dispose used pesticide container?	0.099*	1.000																		
3. Do you usually store pesticide container?	-0.022	-0.125**	1.000																	
4. Do you usually keep pesticide in original container?	-0.010	0.022	-0.027	1.000																
Mixing of Pesticide											1.000									
5. Do you usually follow instruction on pesticide label?	0.062	0.025	-0.069	-0.031	1.000						-0.006	1.000								
6. Do you usually read instruction on pesticide label?	0.030	-0.004	-0.051	0.037	0.067	1.000					-0.009	0.058	1.000							
7. Do you usually use device for mixing pesticide?	0.034	0.044	-0.018**	-0.014	0.012	-0.023	1.000				0.000	0.099**	0.080	1.000						
Use of Personal Protective Equipment and Clothing While Spraying Pesticide											0.640	0.200**	0.102*	0.114*	1.000					
8. Do you usually wear facemask while spraying?	-0.011	-0.024	-0.082	-0.013	0.032	-0.018	-0.006	1.000												
9. Do you usually wear long boots while spraying?	-0.011	-0.024	-0.082	-0.013	0.032	-0.018	-0.006	1.000**	1.000		0.083	0.208**	0.134**	0.173**	0.686**	1.000				
10. Do you usually wear rubber gloves while spraying?	-0.019	-0.042	0.000	0.068	0.018	0.036	0.019	0.314**	0.314**	1.000	0.056	0.070	0.022	-0.005	0.415**	0.385**	1.000			
11. Do you usually wear hat while spraying?	-0.014	-0.031	0.015	-0.017	0.058**	0.008	0.060	-0.019	-0.019	0.032	-0.047	0.067	-0.104*	0.014	0.020	0.033	-0.057	1.000		
12. Do you usually wear goggles while spraying?	0.048	0.007	0.013	-0.036	0.042	0.061	0.018	-0.039	-0.039	0.000	0.148**	0.094*	0.050	0.152**	0.277**	0.259**	0.148**	0.157**	1.000	
13. Do you usually wear long sleeve shirt while spraying?	0.073	0.112*	-0.197**	-0.006	-0.016	0.080	0.246**	0.088	0.088	-0.012										
14. Do you usually wear long pants while spraying?	0.052	0.030	-0.122**	0.021	0.000	0.035	0.092*	-0.069	-0.069	-0.029	-0.035	-0.006	0.034	-0.061	-0.049	-0.034	-0.081	-0.027	-0.041**	1.000

† Variables 1-20 correspond to Appendix 1.

* $P < 0.05$ ** $P < 0.01$

tobacco farmers in Malaysia.

A review of the literature revealed other studies reporting on the extent of pesticide applicators' safe and unsafe practices of pesticide handling in the work place. (16-20, 27-30) However, no study has actually examined the pattern of safe and unsafe practices of pesticide handling in male and female pesticide applicators, especially in developing countries, where prevailing sociocultural and work practices are believed to place female workers at a certain occupational disadvantage compared to male workers.(31) Thus, the present study is aimed at identifying gender differences in safe and unsafe practices of pesticide handling in tobacco farmers.

Subjects and Methods

Subjects

According to the 1991 Population and Housing Census of Malaysia (32), the total population for Malaysia is 17,566,982. Kelantan, on the East Coast of West Malaysia, recorded a total population of 1,181,315. Females comprised 50.7% (599,147) of the total population of Kelantan as compared to 49.3% (582,168) males. The age distribution for the state of Kelantan is as follows: 0-14 years (42.8%), 15-64 years (52.8%), and 65 years and above (4.4%). Malays (91.7%) and Other Bumiputera (0.7%) comprised 92.4% of the total

Table 3 : Factor Loading of 20 Variables of Safe and Unsafe Practices of Pesticide Handling for Eight Common Factors (FC1-8) Extracted by Principal Components Factor Analysis with Varimax Rotation in 395 Male and 101 Female Tobacco Farmers

Variables††	FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8
1	0.018	-0.010	-0.153	0.640	0.156	0.131	0.096	-0.116
2	-0.053	-0.073	0.097	0.627	-0.078	-0.373	-0.216	0.135
3	0.081	0.114	-0.197	0.562	-0.119	0.188	0.210	-0.004
4	-0.201	-0.005	-0.207	-0.192	-0.027	0.043	0.194	0.681
5	0.018	0.059	0.853	-0.045	-0.013	0.081	0.090	-0.028
6	-0.147	-0.077	0.781	-0.203	-0.018	-0.121	-0.021	-0.040
7	0.003	-0.068	-0.083	0.047	0.024	0.797	0.054	0.030
8	0.827	0.025	0.008	0.089	0.093	0.129	0.033	0.109
9	0.804	-0.028	0.026	0.104	0.065	0.180	0.098	0.051
10	0.652	-0.062	-0.144	-0.118	0.142	-0.112	0.023	-0.169
11	0.355	0.062	-0.075	-0.130	0.546	-0.100	0.016	0.008
12	0.317	0.009	0.083	0.188	-0.040	-0.008	-0.129	0.647
13	0.061	-0.015	0.143	0.122	0.068	0.039	0.745	0.080
14	0.404	-0.042	-0.159	-0.014	-0.281	-0.076	0.477	-0.173
15	-0.011	0.970	-0.040	0.004	-0.046	-0.040	0.004	-0.083
16	-0.011	0.970	-0.040	0.004	-0.046	-0.040	0.004	-0.083
17	-0.043	0.518	0.077	0.029	0.147	0.006	-0.038	0.030
18	-0.023	-0.021	-0.051	0.038	0.738	-0.029	-0.059	-0.058
19	0.245	0.013	0.207	0.132	0.503	0.302	0.217	0.058
20	0.301	-0.015	0.179	0.093	-0.126	0.456	-0.315	0.010

† FC1, FC2, FC3, FC4, FC5, FC6, FC7, and FC8 represent the first, second, third, fourth, fifth, sixth, seventh, and eighth factor, respectively; factor loading with values above 0.45 are underlined.
†† Variables 1-20 correspond to Appendix 1.

population of Kelantan followed by Chinese (4.2%), Indians (0.5%), Others (0.8%) and Non-Malaysian Citizens (2.1%).

The state of Kelantan consists of 10 districts (Bachok, Kota Bharu, Machang, Pasir Mas, Pasir Puteh, Tanah Merah, Tumpat, Gua Musang, Kuala Krai and Jeli). The total population of Bachok District according to the 1991 Population and Housing Census of Malaysia (32) was 98,557 (8.3% of the total population of Kelantan). Females comprised 51.4% (50,695) as compared to 48.6% (47,862) males. The age distribution for Bachok District is as follows: 0-14 years (44.4%), 15-64 years (50.3%), and 65 years and above (5.3%). Malays (98.2%) and Other Bumiputera (0.1%) comprised 98.3% of the total population of Bachok followed by Chinese (1.1%), Indians (0.0%), Others (0.3%) and Non-Malaysian Citizens (0.3%).

Tobacco, paddy, and coconut farming is the main occupation of the people of Bachok. Tobacco farming accounts for over 2,000 hectares of land in Bachok District. Tobacco is grown as one crop per year at the end of the monsoon season from February to April.(33) Tobacco cultivation is closely related to the use of pesticides in order to ensure better tobacco leaves for sale. The practice of pesticide handling in tobacco farming in Malaysia is similar in any part of the country where tobacco is a major industry. Therefore, the choice of Bachok as a study area is representative for Malaysia. Within Bachok District, the practice of pesticide handling is also homogeneous in all the eight subdistricts (Beklam, Gunong Timor, Mahligai, Perupok, Repek, Mentuan, Telong and Tanjong Pauh). Thus, random selection of any of the subdistricts is justified to represent Bachok District.

For this study, each of the eight subdistricts was numbered and three, Perupok, Telong and Repek Subdistrict, were randomly chosen. According to the 1991 Population and Housing Census of Malaysia (32), the population of Perupok, Telong and Repek Subdistrict were 16,670, 6,769 and 12,535 respectively. The sex distribution for the three subdistricts is as follows: Perupok {male, 8039 (48.2%); female, 8,631 (51.8%)}, Telong {male, 3,450 (51.0%); female, 3,319 (49.0%)} and Repek {male, 6,070 (48.4%); female, 6,465 (51.6%)}. Data on age distribution was not available.

Table 4 : Differences in Factor Scores of Safe and Unsafe Practices of Pesticide Handling in 395 Male and 101 Female Tobacco Farmers: Analysis of Covariance †

	Males		Females		Differences
Common Factors ††	Mean	SD†††	Mean	SD†††	F-value
FC1	1.78	1.19	1.49	1.19	21.91**
FC2	2.92	0.38	2.95	0.26	2.01
FC3	0.53	0.76	0.84	0.83	8.45**
FC4	1.74	0.70	1.62	0.68	1.42
FC5	2.67	0.57	2.54	0.69	8.15**
FC6	1.64	0.56	1.72	0.50	4.47*
FC7	1.98	0.14	1.85	0.38	11.89**
FC8	1.10	0.34	1.04	0.24	1.40

† The factor is sex (male or female) and covariates are educational level and duration of employment.
†† FC1-8 represent the first, second, third, fourth, fifth, sixth, seventh, and eighth factor, respectively.
††† Standard Deviation.
* $P < 0.01$.
** $P < 0.001$.

In 1993, there were altogether 5000 tobacco farmers registered in the 3 subdistricts chosen, of which 1825, 1765, and 1410 farmers were located in Perupok, Telong and Repek Subdistrict respectively. The sex distribution of the farmers is as follows: Perupok {male, 1445 (79.2%); female, 380 (20.8%)}, Telong {male, 1447 (82.0%); female, 318 (18.0%)} and Repek {male, 987 (70.0%); female, 423 (30.0%)}. Data on age distribution was not available. A 10% random sample of farmers, stratified by the selected subdistricts and sex, was chosen. From July 1 to December 31, 1993, 500 farmers were recruited of which 183, 177 and 140 were from the Subdistrict of Perupok, Telong and Repek respectively. The farmers were contacted through the local offices of the National Tobacco Board in each of the subdistricts and through direct approaches at the work place. These contacts and approaches were mediated and supported by the local Tobacco Planters Association of which the farmers were members. All the 500 farmers selected were successfully recruited into the study. The purpose of the study was explained and their informed consents were obtained.

Of the 500 questionnaires administered and collected, 4 were rejected due to incomplete replies; the remaining 496 questionnaires (395 males and 101 females) were used in the present study.

Methodology

We developed and pretested original structured questionnaires of safe and unsafe practices of pesticide handling in the local Malaysian language for this study. There were 3 sections in questionnaires: sociodemography, pesticide handling practices, and personal health profile.

Sociodemographic questions included respondent's age, sex, marital status, educational level, occupational status, duration of employment, and farm characteristics including size of farm, income from farming and non-farming per month

Appendix 1 : Twenty Safe and Unsafe Practices of Pesticide Handling Questionnaire Checklist

Storage of Pesticide	
1. Do you usually lock pesticide container?	Yes/No
2. Do you usually dispose used pesticide container?	Yes/No
3. Do you usually store pesticide container?	Yes/No
4. Do you usually keep pesticide in original container?	Yes/No
Mixing of Pesticide	
5. Do you usually follow instruction on pesticide label?	Yes/No
6. Do you usually read instruction on pesticide label?	Yes/No
7. Do you usually use device for mixing pesticide?	Yes/No
Use of Personal Protective Equipment and Clothing While Spraying Pesticide	
8. Do you usually wear facemask while spraying?	Yes/No
9. Do you usually wear long boots while spraying?	Yes/No
10. Do you usually wear rubber gloves while spraying?	Yes/No
11. Do you usually wear hat while spraying?	Yes/No
12. Do you usually wear goggles while spraying?	Yes/No
13. Do you usually wear long sleeve shirt while spraying?	Yes/No
14. Do you usually wear long pants while spraying?	Yes/No
Activities During and After Spraying of Pesticide	
15. Do you usually drink water and/or non-alcoholic beverages while spraying?	Yes/No
16. Do you usually eat while spraying?	Yes/No
17. Do you usually smoke tobacco while spraying?	Yes/No
18. Do you usually bathe immediately after spraying?	Yes/No
19. Do you usually wash your hands and face immediately after spraying?	Yes/No
Maintenance of Pesticide Sprayer	
20. Do you usually maintain pesticide sprayer in good condition?	Yes/No

and per season, number of tobacco plants cultivated, distance of house from farm, and number of people working on the farm.

Subsequent section of the questionnaires was designed to identify all the work practices that may pose potential risks of pesticide poisoning in farmers. Twenty questions (variables) pertaining to pesticide handling practices were categorised into the following (Appendix 1): (1) storage of pesticide (questions 1-4), (2) mixing of pesticide (questions 5-7), (3) use of personal protective equipment and clothing while spraying pesticide (questions 8-14), (4) activities during and after spraying (questions 15-19), and (5) maintenance of pesticide sprayer (question 20).

Personal health profile questions included (1) current medical problems, and (2) symptoms of acute pesticide poisoning. The Research and Bioethics Committee of the sponsoring institution in Malaysia approved the questionnaire study.

Trained interviewers administered the questionnaires to the farmers either before commencement of their work, during rest periods or at home when they were not available at work. The study was conducted after obtaining their informed consents.

Statistical Analysis

Means and ranges were calculated for age, duration of employment and annual household income in male and female tobacco farmers; also, numbers and percentages were calculated for marital status, educational level, occupational status and smoking status. Gender difference in these variables was examined using the student's *t* test for continuous data and the chi-squared test for categorical data.

In the analysis of the 20 variables of pesticide handling practices, a simple score of '0' or '1' was given to the response 'yes' or 'no' respectively: a score of '0' was considered an unsafe practice of pesticide handling whereas a score of '1' was considered a safe practice of pesticide handling. Pearson's product moment correlation coefficients were computed between pairs of variables; the level of significance was 0.05.

Principal components factor analysis with varimax rotation was conducted on the 20 variables and common factors with eigen values above 1.0 were selected. Cronbach's alpha was then computed for each of these common factors in order to determine the internal consistency of the common factors' scales.

Factor scores for each common factor in all farmers were computed by adding the scores of the variables (0 or 1) for each common factor across gender. To determine gender difference in each factor score, an analysis of covariance (ANCOVA) was carried out, controlling for the effects of educational level and duration of employment. The level of significance for the difference was set at 0.05.

These analyses were carried out using the SPSS version 6.1 (34) in the Department of Public Health and Occupational Medicine, Graduate School of Medicine, The University of Tokyo, Japan.

Results

Socio-demographic variables of 395 male and 101 female tobacco farmers are shown in Table 1. Duration of employment in females was significantly longer than that in males. In addition, proportion of lower education in females was significantly higher than that in males.

The correlation matrix of 20 variables on practices of pesticide handling and factor loading for 8 common factors extracted by principal components analysis with varimax rotation in 395 male and 101 female tobacco farmers are shown in Tables 2 and 3, respectively. Eigen values were 2.7, 2.2, 1.7, 1.3, 1.2, 1.1, 1.1, and 1.0 for FC1, FC2, FC3, FC4, FC5, FC6, FC7 and FC8, respectively. Cumulative proportions were 0.14, 0.25, 0.33, 0.39, 0.45, 0.51, 0.56, and 0.61 up to the first, second, third, fourth, fifth, sixth, seventh, and eighth factor, respectively.

On the basis of these factor loading (Table 3), 20 variables were classified into 8 groups: (1) use of personal protective equipment (variables 8-10); (2) unsafe work habit (variables 15-17); (3) reading and following instruction on pesticide label (variables 5 and 6); (4) security, storage and disposal of pesticide container (variables 1-3); (5) safe work habit (variables 11, 18 and 19); (6) proper handling of pesticide and maintenance of pesticide sprayer (variables 7 and 20); (7) use of personal protective clothing (variables 13 and 14); and (8) safe handling of pesticide (variables 4 and 12). The internal consistencies, as it was expressed as Cronbach's alpha, were: 0.74 for use of personal protective equipment; 0.69 for unsafe work habit; 0.68 for reading and following instruction on pesticide label; 0.32 for security, storage and disposal of pesticide container; 0.30 for safe work habit; 0.17 for proper handling of pesticide and maintenance of pesticide

sprayer; 0.14 for use of personal protective clothing; and 0.05 for safe handling of pesticide.

Results of analysis of covariance for the eight common factor scores of all male and female tobacco farmers, controlling for educational level and duration of employment, are shown in Table 4. Factor scores for use of personal protective equipment ($p<0.001$), use of personal protective clothing ($p<0.001$), and safe work habit ($p<0.001$) in females were significantly lower than those in males; conversely, the scores for reading and following instruction on pesticide label ($p<0.001$), and proper handling of pesticide and maintenance of pesticide sprayer ($p<0.01$) in males were significantly lower than those in females.

Discussion

Factor scores for use of personal protective equipment, use of personal protective clothing, and safe work habit in female tobacco farmers was significantly lower than those in males. The first factor, personal protective equipment, consists of facemask, long boots and rubber gloves. The use of personal protective equipment is low in female tobacco farmers because their daily clothing are used as suitable substitutes for the conventional personal protective equipment such as the face mask, long boots and rubber gloves. For example, the ordinary head and face cover (*kain tudung*) traditionally worn by Malay women may be viewed as a suitable substitute for the conventional protective facemask recommended by the WHO (35) during the spraying of pesticide. Female tobacco farmers despite working in potentially contaminating work environment do not usually wear long boots because long boots are culturally viewed as "male attire." Similarly, female tobacco farmers do not usually wear rubber gloves. Another possible explanation for this gender difference is the duration of spraying. Since female tobacco farmers have to attend to other daily domestic chores like cooking, washing, cleaning the house, and taking care of children, therefore they will probably spend shorter period of spraying compared to male tobacco farmers. The shorter period of spraying may possibly discourage female tobacco farmers from using personal protective equipment since shorter period of pesticide usage is generally regarded as not harmful to the pesticide applicator. Future socio-anthropological studies, such as focus group interview, will be needed to identify and clarify main reasons for this gender difference.

The second factor, personal protective clothing, consists of long sleeve shirt and long pants. The use of personal protective clothing is low in female tobacco farmers because long sleeve shirt and females in Kelantan do not usually wear long pants. In addition, the questionnaires might have been male-biased because the items constituting personal protective clothing were ordinary attires worn by males. Females in Kelantan usually wear the traditional long dress (*baju kurung*) together with a matching sarong (*kain batik*) in practically all places including at work. This probably accounts for the lower score on the use of personal protective clothing in female tobacco farmers.

The third factor, safe work habit, consists of wearing a hat while spraying, bathing, and washing hands and face immediately after spraying. The score on safe work habit is low in female tobacco farmers because of the following reasons. Firstly, the hat is very rarely worn by women in Kelantan since the traditional Islamic head cover (*kain tudung*) is a more culturally acceptable female attire and regarded as a suitable head cover at work. Secondly, female tobacco farmers did not usually bathe, and wash hands and face immediately after spraying because they may have to attend to other domestic chores immediately after spraying pesticide in the tobacco farms or that as a social custom, males were given first priority in the households, including access to water supply. A similar study claimed that 74% of farmers surveyed immediately washed the entire body and changed clothes at the end of a day using pesticide; however, no gender difference was reported. (36) An earlier study in Bachok District claimed that only 2% of tobacco farmers did not wash after spraying. (15) Therefore, it is highly likely that female tobacco farmers eventually bathe and wash after spraying pesticide.

Factor scores for reading and following instruction on pesticide label, and proper handling of pesticide and maintenance of pesticide sprayer in male tobacco farmers were significantly lower than those in females. The first factor, reading and following instruction on pesticide label, consists of reading, and following instruction, on pesticide label. The score for reading and following instruction on pesticide label is low in male tobacco farmers because they were not the ones usually involved in mixing and preparing the pesticide for spraying. Within the farming household, there is a division of labour whereby women and children do the mixing and preparing the pesticide for spraying while the men undertake the main task of spraying pesticides.

The second factor, proper handling of pesticide and maintenance of pesticide sprayer, consists of using device for mixing pesticide and maintenance of pesticide sprayer in good condition. Similarly, the score for proper handling of pesticide and maintenance of pesticide sprayer is low in male tobacco farmers because of the reasons already mentioned above, i.e., male tobacco farmers were not the ones usually involved in mixing pesticide nor were they responsible for proper maintenance of the pesticide sprayer. Thus, the division of labour within the farming household where women and children were delegated the tasks of mixing pesticide and maintaining the pesticide sprayer in good condition explains the low score obtained by male tobacco farmers on this factor.

A few limitations must be considered in interpreting the results of this study. Firstly, although safety scores have been devised to study safe and unsafe pesticide handling practices in male and female tobacco farmers, it remains unclear whether these scores show significant correlation, and hence validity, with accepted international standards (35). Secondly, the Cronbach's alphas for part of the eight factors' safety scales were not good, indicating low internal consistencies of the safety scales. Thirdly, the scoring for the safety scores were based on a simple dichotomy of 'yes' (scored '1') and 'no' (scored '0'), thereby eliminating possible responses between these two scores. Fourthly, as in any other cross-sectional study, an important drawback is the lack of continuous observation of actual pesticide handling practices at the workplace.

In our present study, gender differences in safe and unsafe practices of pesticide handling were inferable attributed to differences in work habits and social customs across genders. We therefore conclude that: (1) for female tobacco farmers, choice of personal attire tend to result in lower scores on use of personal protective equipment and personal protective clothing while personal hygiene practices result in lower score on safe work habit; and, (2) for male tobacco farmers, the lower scores on reading and following instruction on pesticide label and mixing pesticide and maintenance of pesticide sprayer in good condition suggests that they were not primarily involved in these activities. It is postulated that these differences in safe and unsafe practices of pesticide handling across gender is related to the choice of personal attire, personal hygiene practices and division of labour within farming households which in turn is influenced by prevailing sociocultural norms in the community.

Further longitudinal studies, with standardised scoring scales for factor scores, would be necessary in order to validate the questionnaires in different populations of pesticide applicators. We also propose that a regular risk management program, which is gender- and culture-sensitive, to be introduced to educate tobacco farmers on the health hazards of pesticide exposure.

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Correspondence :

Professor Rusli Bin Nordin,
Department of Community Medicine,
Universiti Sains Malaysia, Health Campus,
16150 Kubang Kerian, Kelantan, Malaysia.
Tel: 6-09-7602048/59 Fax: 6-09-7653370
e-mail: rusli@kb.usm.my

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