บทความวิจัย

Factors Influencing Safety Pesticide Use Behavior among Farmers in Thai Nguyen, Vietnam

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Abstract

The purposes of this cross-sectional correlation research were to describe safety pesticide use behavior and examine the influencing factors of safety pesticide use behavior among farmers in Thai Nguyen province, Vietnam. Multistage sampling technique was used to recruit the sample of 170 farmers. Research instruments included a demographic questionnaire, safety pesticide use behavior, knowledge of farmers in using pesticide, and perceptions of farmer. Descriptive statistics, Stepwise multiple regressions were utilized to analyze the data. The result revealed that most of farmers ranked the safety pesticide use behavior at a moderate level (67.1 %). It means that the farmers still have unsafe behavior in using pesticide. Farmers ranked perceived susceptibility to expose to pesticides at a low level ($\overline{X}$ = 2.23, SD = 0.86), perceived severity of consequences from exposure to pesticides at a low level ($\overline{X}$ = 2.14, SD = 0.97), perceived benefits of adopting safe behavior at a low level ($\overline{X}$ = 2.29, SD = 0.76), and perceived barriers to adopt safe behavior at a high level ($\overline{X}$ = 2.51, SD = 0.88). The most of farmers had knowledge at a medium level and a low level (74.7%). There were positive significant correlation between knowledge (β = .54, $p < .001$), perceived susceptibility (β = .19, $p < .01$), perceived severity (β = .16, $p < .05$) and safety pesticide use behavior. Those factors could explain behavior and accounted for 53% in the variation in the pesticide use behavior (R^2 = .53, $F[3, 166] = 61.36$, $p < .001$). However, gender, educational level, perceived benefits of adopting safety pesticide use behavior, and perceived barriers to adopt safety pesticide use behavior were not the significant predictors of safety pesticide use behavior. The study suggested that nurses and health care providers who work with farmers

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should be focus on predictors to increase safety pesticide use behavior of farmers including knowledge, perceived susceptibility, and perceived severity. In addition, we also need to pay attention on group of male farmer and the farmers who had a low level of education for the future research.

Keywords: Farmers, Pesticide, Safety Pesticide Use Behavior, Factors Influencing, Vietnam.

Introduction and literature review

Global pesticide consumption has increased 50-fold every year (Abrol & Shankar, 2014). The amount of pesticide use is rapid growth in the middle and low income countries (Schreinemachers & Tipraqsa, 2012). In Vietnam, the variety and amount of imported pesticides were increasing rapidly from 20,300 in 2005 to 72,560 tons in 2010 (Huan, Thiet, Chien, & Heong, 2005; Ministry of Agricultural and Rural Development, 2010). Farmer who works in agriculture is one of the main groups of pesticide exposed workers (Calvert, Karnik, Mehler, Beckman, Morrissey, Sievert, Barrett, et al., 2008). Vietnamese workforce is 53.86 million, in which 47.8% of workforce is agricultural-workers (General statistical office, 2011). Vietnamese farmers are also are at risk group from exposure to pesticide.

Pesticide can cause many problems for farmer including acute health effects and chronic effects as well as skin disorder, respiratory effect, and effects on the immune, endocrine and neurological system. In globally, between 1 and 41 million people were suffering health effects every year due to pesticide poisoning (PAN, 2007). There was 4,515 people pesticide poisoning in Vietnam, which had 138 deaths from severe pesticide poisoning (Diep, 2010). This is also a warning about pesticide poisoning pesticide which is increasing in Vietnam today. (Pham, Sebesvari, Tu, Pham, & Renaud, 2011). The behaviors in using pesticide are most importance factors as determinants of diseases among farmers (Broucke & Colemont, 2011). But farmers still have unsafe behavior in using pesticide to protect their health (Matthews, 2008).

From literature review, there are some research studies regarding factors associated with safety pesticide use behavior including individual factors and environment factors (Adeola, 2012). Individual factors should be the target of programs to control pesticide use behavior because individuals ultimate make decisions for their behavior based on directly perception (Grzywacz, Arcury, Talton, Agostino, Trejo, Mirabelli, et al., 2013). The Health Belief Model relates theories of decision making to an individual's perceived ability to choose from alternative health behavior (Rosentock, Strecher, & Becker, 1988). Factors associated with safety pesticide use behavior such as age, gender, education, marital status, farming experience, income, knowledge, perceptions of farmers (Zadjali, Morse, Chenoweth, & Deadman, 2014; Gupta, Gupta, Pallavi, & Patel, 2012). But age, marital status, farming experience, income have weak correlation with safety pesticide use behavior (Hou & Wu, 2010; Kumari & Reddy, 2013). These findings may be explained that the sample was homogeneous in age, income, marital

status, and farming experiences. The roles of age, income, marital status and farming experience are still being debated (Tijani, 2006). Thus, researcher will focus on factors including gender, education, knowledge, perceived susceptibility, perceived severity of consequences form exposure to pesticide, perceived benefits, and perceived barriers due to its strong correlation with safety pesticide use behavior for this study.

Objectives

To describe safety pesticide use behaviors among famers and to determine the influencing factors of the safety pesticide use behavior among farmers in Thai Nguyen, Vietnam.

Methods

A cross-sectional correlation design was applied in the present study to examine the influencing between related factors and safety pesticide use behavior among farmers in Thai Nguyen, Vietnam. G*power was utilized to calculate the sample size. The total number of samples in this study was 170 participants. The Multistage sampling technique was used to select the sample in this study. They were 42 farmers from 420 farmers in Vo Tranh sub-district and 128 farmers from 1,370 farmers in Tan Cuong sub-district. Data was collected during February to April, 2015.

Instruments

Data were collected by using interview-questionnaire, including demographic data (age, gender, marital status, school educational level, year of farming, monthly income of family, spraying time per month, spraying time per year, size of farm and amount of farmer in house), safety pesticide use behavior, perceptions of farmers (perceived susceptibility, perceived severity, perceived barrier, and perceived benefit), and knowledge of farmer in using pesticide. All of instruments were developed in English and had been translated into Vietnamese language by back-translation (Cha, Kim, & Erlen, 2007). The instrument was evaluated for content validity by five Thai experts.

(i) Safety pesticide use behavior (SPUBQ) was used to measure the safer behavior of farmer in using pesticide. There are 32 items and it was rated on four-point Likert's Scale. The scoring criteria in positive statements were 4 points for "always done", 3 points for "often done", 2 points for "sometime done" and 1 point for "never done". The Cronbach's alpha coefficient found in a pilot test with 50 participants was 0.86.

(ii) Perceived susceptibility to expose to pesticide questionnaire (PSuEPQ): There are 18 items and it was rated on four-point Likert's Scales. The scoring criteria in positive statements were 4 points for "very high risky", 3 points for "high risky", 2 points for "low risky" and 1 point for "very low risky". The Cronbach's alpha coefficient was 0.96.

(iii) Perceived severity of consequences from exposure to pesticide questionnaire (PSeCEPQ): There are 16 items and it was rated on four-point Likert's Scale. The scoring criteria in positive statements were 4 points for "very high seriously", 3 points for "high seriously", 2 points for "low seriously", 1 point for "not at all seriously". The Cronbach's alpha was 0.96.

(iv) Perceived benefits of adopting safety pesticide use behavior (PBeASPBQ): There are 13 items and it was rated on four-point Likert's Scale. The scoring criteria in positive statements were 4 points for "very high benefit", 3 points for "high benefit", 2 points for "low benefit" and 1 point for "not benefit". The Cronbach's alpha coefficient was 0.91.

(v) Perceived barriers to adopt safety pesticide use behavior (PBaASPBQ): There are 13 items and it was rated on four-point Likert's Scale. The scoring criteria in positive statements were 4 points for "strongly agree", 3 points for "agree", 2 points for "disagree", and 1 point for "strongly disagree". The Cronbach's alpha coefficient was 0.92.

(vi) Knowledge questionnaire was used to measure the farmer's cognitive about safety pesticide use behavior. The KPUQ measured individual understanding about kind of pesticides, routes of exposure, harmful effect of pesticides and safety practice in using pesticides. There are 20 items and it was rated on two-point dichotomous scales of true or false. Correct answer = 1 score, incorrect answer = 0 score. Scores of knowledge were classified into 3 groups by using Bloom's Theory (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) as well as score d" 60 % was low level, 61 % - 80 % moderate, and > 80.00 % high level. The Kuder-Richardson formula 20 (KR-20) coefficient indicating reliability in this study was 0.76.

Data collection

This study was approved by the Institutional Review Board (IRB), Faculty of Nursing, Burapha University (IRB No. 15-01-2557, Jan. 21, 2015). The data were collected only by the researcher at farmer house or the meeting house in each village on every day from 10 AM to 12 AM and 1.00 PM to 2.00 PM.

Data analysis

All data were analyzed by using statistical package for social science (SPSS 18). Statistical significant level was at level of .05. Descriptive statistics and Stepwise multiple regressions were used to examine the factors influencing safety pesticide use behavior.

Results

1. Description of participants' characteristics

The major of participants were male (53.5 %). A half of participants (52.9 %) were in the age from 31 to 40 years old with mean of 35.15 (SD = 7.44). The major of participant (57.1 %) obtained a primary school (from grade 1 to 9). About 78.2 % of farmers were married. Most of participants (55.9 %) had income from 3,000,000 to 5,000,000 VND. The major of participants had 6 to 10 years in farming (44.7 %). There were 28.8 % and 26.5 % of participant who had 1 to 5 years and greater than 10 years in farming respectively. Most of them sprayed pesticides 3 to 5 times per month with mean of 4.96 (SD = 1.21), but there was 27.1 % of participant who sprayed more than 5 times per month. More than a half of participant (58.8 %) used pesticide for their crops more than 11 months per year. The average size of farm was 2.01 (SD = .76) thousand meter square.

2. Description of knowledge of farmer in using pesticide, perceptions of farmers and safety pesticide use behavior.

2.1 Knowledge of farmers in using pesticides: Most of participants had low to moderate level of knowledge in using pesticides (Mean = 13.66, SD = 3.53). There were 37.6% of respondent who had low level and 37.1% of them had medium level of knowledge.

2.2 Perceptions of farmers in using pesticides: Farmers ranked perceived susceptibility to expose to pesticides at a low level ($\overline{X}$ = 2.23, SD = 0.86), perceived severity of consequences from exposure to pesticides at low level ($\overline{X}$ = 2.14, SD = 0.97), perceived benefits of doing safe behavior at a low level ($\overline{X}$ = 2.29, SD = 0.76), and perceived barriers to safe behavior at a high level ($\overline{X}$ = 2.51, SD = 0.88), as shown on table 1.

Table 1 Mean, standard deviation and level of perceptions of the sample (n = 170)

Perception	Mean	SD	Level
Perceived susceptibility to expose to pesticide	2.23	0.86	Low
Perceived severity of consequences from exposure to pesticide	2.14	0.97	Low
Perceived benefit of adopting safety pesticide use behavior	2.29	0.76	Low
Perceived barrier to adopt safety pesticide use behavior	2.51	0.88	High

2.3 Safety pesticide use behavior

Overall, it was found that most of farmers (67.1 %). ranked safety pesticide use behavior at a moderate level (Mean = 89.33, SD = 11.72) It means that the farmers still have unsafe behavior in using pesticide.

The safety pesticide use behavior of participants could be explained in each step of spraying pesticide including before spraying, during spraying and after spraying as following:

Preparation pesticide, the mean score of behavior of "wearing goggles or eye glasses to cover eyes when mixing pesticide" was lowest ($\overline{X}$ = 2.10, SD = .85). Followed by "wearing rubber glove to cover hands when mixing pesticide" ($\overline{X}$ = 2.13, SD = .80), and "wearing long - sleeve shirt to cover the body when mixing pesticide" ($\overline{X}$ = 2.18, SD = .79)

During spraying, the mean score of behavior of "smoking cigarettes nearby pesticide area" was lowest ($\overline{X}$ = 2.06, SD = 1.24). Followed by "eating foods or drinking water nearby pesticide area" ($\overline{X}$ = 2.16, SD = 1.28), and "wearing rubber boots to cover feet" ($\overline{X}$ = 2.17, SD = 1.23)

After spraying, the mean score of behavior of "changing spraying-clothes before arriving house" was lowest ($\overline{X}$ = 2.49, SD = 1.18). Followed by "reuse the empty pesticide containers or bottles to store water or foods" ($\overline{X}$ = 2.56, SD = 1.17), and "washing spraying-clothes with others" ($\overline{X}$ = 2.62, SD = 1.22).

3. Results of univariate analysis examining factors associated with safety pesticide use behavior.

There were the statistical significant association between all independents variables and safety pesticide use behavior. An independent-samples t-test was conducted to compare the behavior scores for male and female. There was significant difference in mean score for male and female famer. A one-way ANOVA analysis of variance was conducted to compare the behavior scores for three educational levels. The result revealed that at least one pairs of educational level had a difference means of safety pesticide use behavior significantly. The Pearson correlation test showed that perceptions and knowledge were statistical significant correlated with safety pesticide use behavior as well as perceived susceptibility ($r = .50$, $p < .01$), perceived severity ($r = .45$, $p < .01$), perceived benefit ($r = .46$, $p < .01$), perceived barrier ($r = -.43$, $p < .01$) and knowledge ($r = .67$, $p < .01$).

4. Results of multivariate analysis examining factors predicted safety pesticide use behavior.

Among seven factors related to pesticide use behavior including gender, educational level, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, knowledge, there were three variables which could predict pesticide use behavior. In which, knowledge was entered into the first model, first model showed that knowledge could significantly explain behavior and accounted for 45% of variation in the

pesticide use behavior (R^2 = .45, F[1, 168] = 137.17, p < .001). Knowledge and perceived susceptibility were entered into the second model, second model showed that knowledge and perceived susceptibility could significantly explain behavior and accounted f or 51% of variation in the safety pesticide use behavior (R^2 = .51, F[2, 167] = 86.64, p < .001). Knowledge, perceived susceptibility and perceived severity were entered into the final model. The final model showed that knowledge, perceived susceptibility and perceived severity could explain behavior and accounted for 53% in the variation in the pesticide use behavior (R^2 = .53, F[3, 166] = 61.36, p < .001), as shown on table 5.

Table 5 The influencing factors of safety pesticide use behavior among farmers (n = 170)

Predictors	B	SE	Beta	
Knowledge	1.78***	.20	.54***	Intercept = 52.86***
Perceived susceptibility	.17**	.06	.19**	R^2 = .53, F (3, 166) = 61.36***
Perceived severity	.15*	.06	.16*	

* = p < .05, ** = p < .01, *** = p < .001

The equation for predicting value of pesticide use behavior could be written:

1) Unstandardized coefficients equation:

Safety pesticide use behavior = 52.86 + 1.78 (knowledge) + 0.17 (perceived susceptibility) + 0.15 (perceived severity).

From this equation, it can be implied that for each one unit increases on knowledge toward safety pesticide use behavior, there was 1.78 times that responds will get good behavior in using pesticide. One unit increases on perceived susceptibility toward safety pesticide use behavior, there was .17 times that responds will get good behavior in using pesticide. One unit increases on perceived barriers toward pesticide use behavior, there was .15 times that responds will get good behavior in using pesticide.

2) Standardized coefficient equation:

$$Z_{\text{safety pesticide use behavior}} = 0.54(Z_{\text{knowledge}}) + .019(Z_{\text{perceived susceptibility}}) + 0.16(Z_{\text{perceived severity}}).$$

It can be implied that knowledge in using pesticide was the most important variable to predict safety pesticide use behavior, the second was perceived susceptibility to expose to pesticide and the third was perceived severity of consequence from exposure to pesticide.

Discussion

The findings of this study were discussed as follows:

Safety pesticide use behavior among farmers in Thai Nguyen, Vietnam.

For overall, the result showed that farmers ranked safety pesticide use behavior at a moderate level, accounted for 61.1 %. It meant that the farmers still have unsafe behavior in using pesticide. This finding was similar with the results of most studies in other countries. In Thailand, the unsafe behavior, especially related to the use of improper personal protective equipment, were at a remarkably high level (Raksanam, Surasak, Siriwong, & Robson, 2012). Unsafe behaviors

were identified as the storage of pesticide products at home, the preparation of pesticides in the kitchen, inadequate disposal of empty pesticide containers, eating and drinking during pesticide application, and using inadequate protective clothing among farmers in Palestine (Zyoud, Sawalha, Sweileh, Awang, Al-Khalil, Al-Jabi, et al., 2010).

Preparation pesticide, the unsafe pesticide use behaviors were determined as behaviors of "wearing goggles or eye glasses to cover eyes while mixing pesticide", ($\overline{X}$ = 2.10, SD = .85), "wearing rubber glove to cover hands when mixing pesticide" ($\overline{X}$ = 2.13, SD = .80), "wearing long-sleeve shirt to cover the body when mixing" ($\overline{X}$ = 2.18, SD = .79) and "carry pesticide with water and foods ($\overline{X}$ = 3.23, SD = .84). The result can be explained because the farmers perceived that they are not susceptible to expose to pesticide before spraying and mixing pesticide. In the other hands, farmers felt difficult to read, and understand the instruction of pesticide. They mix and spray pesticide follow their experiences or suggestions of chemical seller and other farmers. These results was accordance with other researches farmers perceived that expose to pesticide may not be a threat because they are immune, it is regarded as a medicine that is needed by the plants rather than poison and they believed that worning PPE would cause Pasma (muggy) (Khan, Muhammad, Hafiz & Waqar, 2013)

During spraying, most of farmers always and often done the unsafe pesticide use behaviors in "smoking cigarettes nearby pesticide area" ($\overline{X}$ = 2.06, SD = 1.24), "eating foods or drinking water nearby pesticide area" ($\overline{X}$ = 2.16, SD = 1.28), "wearing rubber boots to cover foots" ($\overline{X}$ = 2.17, SD = 1.23) and blowing clogged nozzle by mouth ($\overline{X}$ = 3.16, SD = .92).

The common reasons given for not doing safety pesticide use behavior were too stifling, uncomfortable and can cause illness. They also felt hot or inconvenience when they worn PPE and the PPE inhibited their work. In the other hands, farmer did not perceive benefits of adopting safety pesticide use behavior especially PPE. Hence respondents do not pay attention in using PPE. Another reason is that farmers had low knowledge about main route of exposure to pesticide. A half of them responded that main route of exposure to pesticide is through inhalation. Farmer blew clogged nozzle because they did not have any tool to do it and they responded that blowing is a good method to clear nozzle. These findings were in line with some researches. This result accordance with another finding, Palis, Flor, Warburton and Hossain (2006) mentioned that most of farmers did not take adequate protection from pesticides because they believed that the main route of exposure was only through inhalation.

After spraying, even though farmers did the safety pesticide behavior but most of farmers still had unsafe behaviors in using pesticide as the behaviors of "changing spraying - clothes before arriving house" ($\overline{X}$ = 2.49, SD = 1.18), "re-use the empty pesticide containers or bottles to store water or foods" ($\overline{X}$= 2.56, SD = 1.17), and "washing spraying- clothes with others" ($\overline{X}$ = 2.62, SD = 1.22). The result can explain because that washed spraying-clothes wasted their times, and their money also. In addition, half of participants had an incorrect knowledge in storing pesticide method, an incorrect knowledge in re-use empty pesticide container/ bottle. In fact, have no special company for disposal empty pesticide container/ bottle in Thai Nguyen city.

Factors influencing safety pesticide use behavior among farmers in Thai Nguyen, Vietnam.

Knowledge of farmer in using pesticide had a positive relationship with pesticide use behavior (β = .54, p < .001). This indicates that a farmer who has high knowledge in using pesticide they will act to get safety pesticide use behavior. Knowledge of farmer in using pesticide was the consistent with component of the HBM to show the significant predictor of safety pesticide use behavior in this study. HBM mentioned that knowledge level could indirectly influence health related behavior, the higher knowledge, the more likely individual is to report a good behavior. This result was in line with some research revealed that if the farmers have good knowledge about kinds of pesticide and the health effect of pesticide they use, they will prevent risky behavior in using pesticides (Mohanty, Behera, Jena, Srikanth, Mogane, Samal, et al., 2013).

Perceived susceptibility had a significant positive relationship with pesticide use behavior (β = .19, p < .01). This indicated that the more perceived susceptibility, the more likely farmer is to report a good behavior. According to the HBM, individual will act to avoid a health problem, but they first need to believe they are personally susceptible to the problem. Individuals will take action to control health behavior if they regard themselves as susceptibility to consequences of behavior. Farmers generally were not perceived of potential hazards related to pesticide use that might cause harm to them and their families (Wongwichit, Siriwong, & Robson, 2012). In addition, Strong, Thompson, Koepsell, and Meischke, (2008) mentioned that performance of exposure prevention behaviors was significantly and positively associated with perceived susceptibility (p = .001).

Moreover, perceived severity had was positive related with safety pesticide use behavior (β= .16, p < .05). This indicates that the more perceived severity, the more likely farmer is to report a good behavior. In addition to perceived susceptibility and other variables predict safety pesticide use behavior. These variables could predict 53% of variation in safety pesticide use behavior. Perceived severity of consequence from exposure to pesticide was the consistent component of the HBM to show the significant predictor of safety pesticide use behavior in this study. HBM indicated that individuals take actions toward health if they believe harm can be serious. The result was accordance with some researcher viewed perceived severity of consequences of exposure to pesticide was important factor in shaping individual's behavior. This factor is to convince farmer to take more protection. This evident suggested that risk perception of farmer is low and they are less likely to take safety behavior (Khan, et al., 2013). Raksanam, et al. (2012) also mentioned that a high perceived severity of pesticide hazard was correspondingly high risk pesticide use behaviors (β = .59, p < .005).

Perceived benefit to adopt the safety pesticide use behavior and perceived barrier to do the safety pesticide use behavior were not significant predictors of pesticide use behavior. The results could explain that maybe these variables were affected by other variables resulted. In the other hands, the HBM mentioned that the effects of perceived benefit and perceived barrier to behavior were different with the way that perceived susceptibility and perceived severity affected to a behavior even though four of them were the perceptions. In context of HBM, the combined levels of susceptibility and severity provide the energy or force to act and the perception of benefits (over barriers) provide a preferred path of actions. Perceived benefits and perceived barriers were likelihood of action. These were the reasons why perceived benefit and perceived

barrier were not significant predictor factors even though perceived susceptibility and perceived severity were significant. The result accordance with another research indicated that perceived benefits of adopting safety pesticide use behavior and perceived barrier to do the safety pesticide use behavior were not significant predictors of pesticide use behavior (β = - .01, p = .74; β = - .12, p = .053 respectively). (Raksanam, et al., 2012). However, the study revealed that farmers had perceived benefits at low level and perceived barriers at high level.

The longitudinal studies are recommended since these would further permit a more in-depth understanding of the safety pesticide use behavior and help to examine factors influencing safety pesticide use behavior. The intervention studies to increase pesticide use behavior were recommended for future researches and should be focused on predictors including knowledge, perceived susceptibility, and perceived severity.

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