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Original Article

Health Symptoms and Health Literacy of Pesticides Used among Thai Cornfield Farmers

Taweewun SRISOOKKUM [1], Ratana SAPBAMRER [2]

1. *Department of Public Health, School of Medicine, University of Phayao, Maekha Subdistrict, Mueang Phayao, 56000 Thailand*
2. *Faculty of Medicine, Chiang Mai University, Sriphum, Mueang, Chiang Mai, 50200, Thailand*

***Corresponding Author:** Email: taweewun.ch@up.ac.th

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Abstract

Background: We aimed to explain health symptoms and health literacy on the use of pesticides, investigate predicting factors and to formulate the health literacy model for the appropriate use of pesticides by cornfield farmers in the northern of Thailand.

Methods: The reliability and validity from 246 samples were selected by proportional stratified random sampling. Data were collected through a questionnaire in 2016 in Phayao province and were analysed by descriptive statistics and logistic regression.

Results: All of samples exposed from paraquat, the mean years of farm experience were 14.1 yr and five groups of health symptoms from pesticides were muscle and skeleton, epithelial/ mucosal, neurobehavioral, gastrointestinal and endocrine group. The predicting factors had influenced the health literacy of cornfield farmers regarding the use of pesticides were as following: 1) attitude on pesticides exposure (OR= 1.43, CI=1.26-1.64), 2) prevention of the practice of pesticides exposure(OR= 1.03, CI=1.01-1.05) 3) outcome of the expectation on the prevention of pesticides exposure (OR= 0.584, CI=0.41-0.82), 4) the number of secondary occupation(OR= 0.58, CI=0.38-0.89). These affecting factors were considered for the construction of a health literacy model on the use of pesticides. It could predict the model at 42.5%. The health literacy model could be equal to constant (6.85) + attitude on pesticides exposure (0.36) + behavior on the prevention of pesticides exposure (0.03) – outcome expectation on the prevention of pesticides exposure (0.54)- frequency of secondary occupation (0.53).

Conclusion: We recommend intervention of attitude, practice, outcome expectation and occupation to set up policy for health services among cornfield farmers.

Keywords: Health symptoms; Health literacy; Pesticides; Cornfield farmers

Introduction

According to WHO, there were uses of pesticides to prevent the crops from the harm of destructive insects, weeds, fungi and other pests (1). The effect of pesticides is toxicity to humans. It can issue both severe and chronic health effects. However, this will depend on the quantity and ways that person receives. The increasing trend of disease from pesticides was about 4.6 count in the year 2010-2016 (2,3). In 2010, the morbidity of disease from pesticides was 2.91 per 100,000 population whereas in 2016 the morbidity of disease pesticides was 14.47 per 100,000 population. The field famers were the most occupation who got sick from using pesticides and 70.81% of age group from 15-59 yr old (2, 3).

In Thailand, cornfield was a crucial economic farm especially in the northern part of Thailand, where the most plants and most harvest has

come from (4). Pesticides especially glyphosate and paraquatdichoride were used to grow corn (5), because these pesticides helped farmers solving problems of insects and requiring good product as Table 1 shows (6). The Department of Agriculture showed that the three most import pesticides of Thailand on 2018 were herbicides, fungicides and insecticides (7). As a result, cornfield farmers were were directly affected and contaminated with the pesticides.

Table 1: Distribution of pesticides use among Thai farmers by crop

Type of pesticides	*Type of crop (%)*			
	Rice	*Farm*	*Fruit*	*Vegetable*
Insecticides	79.4	32.4	4.4	1.5
Herbicides	78.7	64.0	2.9	0.7
Fungicides	40.4	25.7	2.9	2.2
Acaricides	33.1	9.6	1.5	2.22
Others	2.2	2.9	0.0	1.5

Health literacy states the cognitive and social skills indicating the motivation and capability of each individual to access realize and apply information in the proper ways. These could develop and maintain good health and increase the knowledge, health circumstance and attitude, to contribute good health outcome (8-10). The health literacy is important for everyone because it helps us make a better choice in taking care of ourselves (11). It means good health literacy is a basic health care. People of low health literacy have higher risk of being admitted at the hospital (12), and visit the emergency department more than people who have high health literacy (13). Moreover, low health literacy in aging is a risk to a high mortality rate (14).

Health literacy researches consisted of many groups, such as students, workforce and aging group (15, 16), village health volunteer group (17), minor group (18), diabetes mellitus (19-21), hypertension(19), hyperlipidemia (19, 20, 22) and chronic obstructive pulmonary disease group (23). Health literacy researches consisted of many groups such as youth (24), workforce (25-27) aging (28-31), minor group (32) and diabetes mellitus (33, 34). Furthermore, many researchers found out about the factors affecting health literacy, such as age (19), sex (24, 26, 30-32), education (19, 24, 25, 27, 30), income (19, 24), self-efficacy (32, 33), social support (21, 23), outcome expectation (34), occupation (19) and attitude (35, 36). Besides, many groups were farmers of rice (6, 37), vegetables (6, 38-40), fruit (6, 39), flower (37, 39) and corn (38).

We aimed to explain health literacy on the proper use of pesticides, to investigate predicting factors and to formulate a health literacy model on the appropriate use of pesticides among cornfield farmers.

Materials and Methods

This cross-sectional study was conducted in the sub-district of Phayao Province, north of Thailand, with the most corn plant there. The participants were 246 cornfield farmers (41) randomized by proportional stratified random sampling which consisted of three steps. The first step was the division of village on the area of study into 10 stratums, the second was to choose proportionally from each stratum, and the last was to take samples from each stratum with 246 samples.

The research instrument was a questionnaire, constructed by the researchers, adapted from the concept of Kaewdumkeng and TreePhetoorai (42). It consists of eight parts as follows: the first part is six items regarding the socio-demographics characteristics. The second part is five items the kind and information of used. The third part is six items regarding the views on the use of pesticides and health symptoms from it. The fourth part is eight items about attitude on use of pesticides. The fifth part is eight items about social support on the prevention of pesticides using. The sixth part is 30 items dealing with behavior on the prevention of pesticides using. The seventh part consist of 14 items which

are divided into two sub- sections; 6 items of self-efficacy and 8 items of outcome expectation on the prevention of pesticides using.

The last part is 23 items about health literacy on use of pesticides divided into five sub- sections. The first one is three items about knowledge on use of pesticide. Second, is six items dealing with the prevention of the use of pesticides. Third, is seven items about decision - making skill for health reasons. The fourth, is five items of self-management skill, and lastly, is five items about communication skill for promotion and risk reduction health.

Before administering the survey, the questionnaire was verified regarding its content validity by expert groups. The reliability of health literacy on the use of pesticides among corn farmers was validated by using Kuder-Richardson-20, which was at 0.71. The attitude, social support on the prevention of pesticides using, self-efficacy outcome expectation on the prevention of pesticides using was validated by using the Cronbach's Alpha coefficient with the result of 0.71, 0.61, 0.59 and 0.73.

After this research was approved by the Ethical Committee of University of Phayao No. HE-56-02-04-0037, researchers informed the district leader about the project research in order to support and publicize the data collection. Researchers trained assistant researchers about the collection of data in the area. Finally, it was put together and was analyzed using descriptive statistics and multiple logistic regression.

Results

From Table 2, the data showed that 80.5% of the gender were male; 70.3% of age was 50-59 yr the mean age was 53.1 yr old, minimum age was 30 yr old and a maximum age was 85 yr old, 80.3% of the samples had studied in primary school; and 67.5% of them earned money, which is not enough for saving.

Table 2: Socio- demographics and health literacy of pesticides usingamong farmers

Demographics and health literacy	*Frequency*	*Percentage*
Sex		
Male	198	80.5
Female	48	19.5
Age (yr)		
39-30	13	5.3
49-40	48	19.5
50-59	173	70.3
≥60	12	4.9
$\bar{x}$ = 51.3; SD. = 7.85 ; Min-Max = 30-85		
Education		
Illiterate	9	3.7
Primary school	194	78.9
Secondary school	9	3.7
High school	23	9.3
Higher than high school	11	4.5
Economy Status		
Not enough	2	2.0
Not enough for saving	166	67.5
Enough for saving	75	30.5
Occupation		
Main Occupation	246	100.0
Secondary occupation		
Rice farmers	233	94.7
Vegetable farmers	162	65.9
Labor	112	45.5
Merchant	28	11.4
Civil officer	9	3.7
Health literacy		
Low (9-16.4)	114	46.3
High (16.4-23.0)	132	53.7
$\bar{x}$ = 16.5 ; SD. = 3.47 ; Min-Max = 9-23		

Not only samples worked as corn farmers but 94.7% of samples also worked as rice farmers. Distribution of samples by health literacy showed that 53.7% of samples have a high health literacy level and 46.3% of the samples have a low health literacy level.

Table 3: Pesticides using and source of information

Variables	*Frequency*	*Percentage*
Categories of pesticides using		
Herbicides	246	100.0
1. Paraquat	246	100.0
2. Oxyflurofen	191	77.6
3. Gyphosate	67	27.2
4. Ametryn	40	16.2
5. Alaclor	5	2.1
Insecticides		
Pyrethoids(Cypermetrin)	20	8.1
Farming experiences		
2-9 yr	132	53.7
10-19 yr	36	14.6
38-20 yr	78	31.7
$\bar{x}$ =14.1; SD. = 6.9 ; Min-Max = 2-38		
Source of buy pesticides		
Inner village	84	34.1
Outer village	154	62.6
Market and District	8	3.3
Method of payment		
Cash	189	76.8
Installment	57	23.2
Source of perceived pesticides		
Label at pesticide bottom	227	97.0
Television	94	40.7
Leaflet	60	25.6
Big board in the village	43	18.3
Magazine	11	4.7

Table 4: Health symptoms from pesticides exposure among farmers

Health symptoms	*Frequency*	*Percentage*
Muscle and skeleton		
Back pain	69	28.0
Muscle weakness	5	2.0
Epithelial/ mucosal		
Itchy skin	43	17.5
Nose irritation	37	15.0
Rash	27	11.0
Conjunctivitis	7	2.8
Eyestrain	7	2.8
Neurobehavioral		
Dizziness	26	10.6
Confuse	2	0.8
Gastrointestinal		
Nausea	6	2.4
Vomiting	2	0.8
Diarrhea	2	0.8
Endocrine		
Weight loss	4	1.6
Tachycardia	4	1.6

The mean score of health literacy was 16.5 with standard deviation of 3.4. From Table 3, it showed the categories of pesticides used. Most of the samples used herbicides and 8.1% used insecticides. There were six types of pesticides used. The duration of using pesticides showed that 53.7% were from 2-9 yr and the mean years of farming experience was 14.1 yr. Samples had bought pesticides from outer village (62.2%), and 76.8% paid by cash. The majority of the samples (97%) had an idea on how to use the pesticides by reading the labeled instruction at the bottom of the container of the pesticides.

Table 4 shows the five groups of health symptoms were muscles, muscle, and skeleton, epithelial / mucosal, neurobehavioral, gastrointestinal and endocrine group. The top five symptoms, which affected samples were back pain, itchy skin, nose irritation, skin rash and dizziness. Table 5 shows the list of the 5 dependent variables regarding prevention of pesticide exposure among farmers.

Table 5: Scores of dependent variables regarding prevention of pesticides expose among farmers

No	*Dependent variables*	$\bar{X}$	*SD.*	*Min-Max*
1	Attitude on pesticides exposure	19.2	3.9	12-30
2	Social support on prevention of pesticides exposure	26.0	7.9	8-56
3	Behavior on prevention of pesticides exposure	101.6	24.7	48-150
4	Self-efficacy on prevention of pesticides exposure	17.6	0.9	13-18
5	Outcome expectation on prevention of pesticides exposure	23.3	1.1	20-24

Table 6 shows the list of the 14 variables of this study. The multiple logistic regression revealed that four independent variables influenced to the health literacy of using pesticides among Thai cornfield farmers. A very strong variable was the attitude on pesticides exposure which means that the sample groups who had high score of the attitude on pesticides exposure had 1.43 times higher probability than the sample groups who had lower score to receive health literacy score. The affecting factors were taken into consideration in order to construct a health literacy model of pesticides used and could predict model at 42.5% with the statistical functions, as follows:

The health literacy model

= constant (6.85) + AT (0.36) + PRT (0.03) – OE (0.54)- OC (0.53).

Table 6: Multiple logistic regression for health literacy of pesticides using

No	*Variables*	*B*	*Wald-test*	*P-value*	*Odd Ratio*	*95% CI*
1	Age	0.31	2.13	0.144	1.03	0.98-1.07
2	Frequency of side effect(SE)	-0.03	0.16	0.689	0.96	0.81-1.15
3	Frequency of occupation (OC)	-0.53	6.31	0.012*	0.58	0.38-0.89
4	Frequency of pesticides using(PED)	0.16	1.92	0.166	1.18	0.93-1.56
5	Attitude on pesticides using(AT)	0.36	29.43	0.000***	1.43	1.26-1.64
6	Social support on prevention of pesticides exposure (SS)	0.26	1.02	0.311	1.03	0.97-1.07
7	Behavior on prevention of pesticides exposure (PRT)	0.03	9.50	0.002**	1.03	1.01-1.05
8	Self-efficacy on prevention of pesticides exposure (SE)	-0.02	0.94	0.319	0.31	0.47-1.28
9	Outcome expectation on prevention of pesticides exposure (OE)	-0.54	9.46	0.002**	0.58	0.41-0.82
	Constant	6.85				
	2 Loglikelihood = 237.18	Nagelkerke R^2 = 0.425 ; Chi-square test =92.77				

Discussion

This study showed that 80.5% of the samples were male similar to another study (39). Most of them in other studies were female (5, 37). The mean age of the 246 farmers in our study was 53.1 yr old as the mean age of farmers was 54.3 yr old elsewhere (37). The majority of samples had primary school, conformed to other studies (5, 39) which showed that 65% and 62.5% of the samples had primary school. Overall 81.8% of samples had adequate health literacy, which was higher than another study where 53.7% of corn farmers had high health literacy (26). However, the results of this study were higher than the findings of others (23, 25, 30) which showed 40.6%, 42.0% and 48% of the samples had adequate health literacy.

Most the samples used herbicides. The annual quality of active ingredient of pesticides uses were herbicide (glyphosate and paraquatchloride) (5). In the contrast, farmers used insecticides more than herbicides because the samples in this study were in different area from those previous studies (37). Farming experience of samples were 14.1 yr, similar to another study wherein, 48.1% of the participants had been engaged in corn farming for more than 20 yr (39). This was significantly related to the findings of this study, which showed that 31.7% of the samples had been engaged in corn farming for more 19 yr. Most of the participants had an idea on how to use the pesticides by reading the labeled instruction at the bottom of the container of the pesticides whereas others (6, 40) reported that farmers got pesticide information from poster reading.

The five groups of health symptoms were similar to another study (37). The results of previous studies revealed symptoms were higher than this research (6, 37, 38). Independent variables were significantly predicting the health literacy of pesticides among cornfield farmers. The attitude on pesticides using were significantly predicting the health literacy, congruent with another study (35). Attitudes were positively correlated with health literacy teaching intension (34) as attitude was a lens to understanding health literacy (36). The outcome expectation on the prevention of pesticides using conforms to Reisi et al (34) which reveal that outcome was associated with communication and critical health literacy. The behavior on prevention of pesticides using is in contrast to many researches, which showed the interaction health literacy positively correlates with behavior (18); the functional health literacy positively correlates with behavior (20); the health literacy positively correlates with behavior (22), and the health literacy correlates with health promoting behavior (24). The frequency of occupation on the use of pesticides conforms to Thummaphol et al (19).

Conclusion

Actions should be taken into these two issues; first, the intervention of corn field farmers among low health literacy and should apply intervention on attitude, behavior, outcome expectation and occupation. Second, policy should be set up to understand the proper usage of pesticides among cornfield farmers in context of this study and to the similar areas.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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