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Model development to reduce pesticide risk behaviors among rubber farmers in Khogyang Community, Trang, Thailand

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Abstract

Pesticide exposure is one of the most important occupational risks in Thailand. A specific community based participatory model to reduce pesticide risk behaviors among rubber farmers in the Southern of Thailand remains limited. The study objectives were: (1) to develop community based participatory model to reduce pesticide risk behaviors among rubber farmers; and (2) to evaluate their knowledge, health beliefs and behaviors related pesticide use. Data collection from seventy one rubber farmers in 8 villages of Khogyang community was completed by focus group discussions, observation, and in-depth interviews. This study was conducted in Khogyang community, Trang, Thailand between December 2012 and March 2013. The contents of the Khogyang community based participatory model included: (1) pesticide safety education delivery at home; and (2) community-based participatory action activities addressed pesticide safety behaviors (pesticide safety behaviors drawing contest; pesticide safety community forums; and Khogyang advisory committee engagement). New materials, such as pesticide safety picture booklets, and posters were developed using ideas from the Khogyang community participants. The results showed that knowledge of rubber farmers on pesticide use was 11.82 + 3.33, observed at low level. The score of belief regarding pesticide use was 3.57 + 0.40. Behavior of farmer participants on pesticide safety was 2.87+0.42. Positive statistically significant correlations between belief and behavior (r = 0.47) was found. To sustain the intervention program, collaboration with the Khogyang community partners and the Khogyang authorities is needed. It is necessary to monitor changes of knowledge, belief, and behavior related pesticide use in next six months.

Keywords: First keywords, second keywords, third keywords, forth keywords;

1. Introduction

Pesticide risk behavior is one of the most important occupational risk behaviors among farmers in Thailand (Raksanam B. et al., 2012; WHO, 1990; Panuwet et al., 2012; Robson et al., 2010; Siriwong, 2008; Jaipieam 2009; and Weisenburger et al., 1999). Short term health effects are irritation of the skin, eyes, nose, impaired of lung functions, visual function, memory disorder, impaired of liver function, kidneys and stomach discomforts, nervous system problems. (Ecobichon, 2000; Weisenburger et al., 1999; Robson et al., 2001; Keifer and Firestone, 2007; Alavanja et al., 2004; Calvert et al., 2008; Tan and Mustafa, 2004; Robson et al., 2010; Quandt, S.A., 2006, Siriwong et al., 2008). Several studies have found that farmers are at elevated risk for various cancers, which is related to their exposure to pesticides (Robson et al., 2010). The need to use large amounts of pesticides in Thailand has raised human health concerns (Bureau of Epidemiology, Department of Disease Control, MOPH, 2012). The total quantity of imported pesticides had dramatically increased in Thailand. The trend of reported cases of pesticide poisonings

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from 2005 to 2011 had dramatically increased (Bureau of Epidemiology, Department of Disease Control, MOPH, 2012). This study was conducted in Tambon Khogyang, Kuntang district, Trang province, Thailand. Trang province is a neighbouring province of Songkhla province. It is situated on the Trang river. Individuals living in the Khogyang community often not aware that specific issues, including pesticide safety, occur in their homes and they may not understand the potential adverse effects of pesticide use on their families' health. Few studies exist that develop model risk behaviors related to pesticide use among rubber farmers in the Southern of Thailand. However, a specific comprehensive model to reduce pesticide risk behaviors among rubber farmers in Thailand remains limited. The principles of the Health Belief Model (Becker et al., 1978) and community participatory approach were applied to develop a comprehensive strategy to reduce pesticide risk behaviors (Raksanam B. et al., 2012). In this study, we focused on rubber farmer's perceived susceptibility, severity, benefits, and barriers as they relate to decisions about whether to take action about health concern regarding pesticide use.

Participation of community members in health model development increases the likelihood that the model culturally appropriate so its format and content better fit the cultural systems of the community (Glanz et al., 2002; Arcury et al., 2002; Arcury et al., 2009). The study objectives were: to develop model to reduce pesticide risk behaviors and; to evaluate knowledge, beliefs and behaviors related pesticide use among the Khogyang rubber farmers between December 2012 and March 2013.

2. Materials and methods

This study was conducted in the Khogyang community between December 2012 and March 2013. This study was designed to maximize internal validity despite our inability to randomize samples. The study was designed to reduce confounding variables as much as possible, given that random assignment was not available. The eligibility criteria of the participants included rubber farmers who lived in the Khogyang community, who had used pesticides for at least one year, and who were willing to participate in the study. Seventy one rubber farmers from the Khogyang community were randomly recruited. Data collection was completed using a combination of quantitative and qualitative methods. The research procedure was divided into two phases: (1) situation analysis study phase and; (2) model development phase.

Situation analysis study phase included building connections, conducting a community study, a cross-sectional survey, recruiting rubber farmer participants and, assessing the community stakeholder' s needs. The objective of this phase was to analyze the factors affecting health risks and pesticide hazards among rubber farmers in the Khogyang community.

Model development phase focused on a designing the intervention model. New materials, such as pesticide safety picture booklets, and posters were developed using ideas from the Khogyang community rubber farmer participants. These served as a guideline for introducing the ideas of Khogyang community involvement in health related to pesticide risk behaviors. The materials were distributed to the rubber farmer participants who participated to the Khogyang community-based activities on pesticide safety. The activities provided during the model development phase included: Khogyang community key person in-depth interview and focus group discussion; broad awareness-raising activities including: Khogyang community forums focused on following topics: introduction to pesticides, health risks associated with pesticide exposure, pesticides safe handling and use, pesticides poisoning and management in the community.

Content validity of research instruments were verified by four experts on community health, environmental health, behaviors, and social sciences. A pilot project was carried out in the Lamoo community with 30 purposive sampling rubber farmer subjects. The study procedure was approved by the Sirindhorn College of Public Health Trang Ethical Committee (Under Protocol No.13/2013). In addition, numbers and codes were used during the data collection phase to ensure that the data remained confidential. Consent forms were obtained before the data collection commenced. The research instruments were questionnaires on (1) knowledge, (2) health beliefs, and (3) behaviors regarding pesticide risk use, as well as (4) a focus-group discussion guideline.

The questionnaire on knowledge was concerned with basic knowledge of pesticide risk behaviors. All of the 21 questions in this part were in multiple-choice format. Examples of the questions included: What are the dangers of pesticides? What are the most important reasons to consider when choosing pesticides? What should you do if the nozzle is clogged while you are spraying pesticide?

The questionnaire concerning beliefs on pesticide use was divided into four sections including perceived susceptibility, severity, benefits, and barriers to using pesticides. The 22 questions were scored on a five-point Likert scale, ranging between strongly agree, agree, uncertain, disagree, and strongly disagree. The questionnaire asked the rubber farmer participants to rate statements such as: For your safety, you should always read pesticide instructions before use; to reduce the risk of exposure to pesticides, you should spray in the same direction as the wind.

The questionnaire concerned with pesticide use behaviors was divided into three sections of 20 questions specifically on self-care practices before, during, and after handling pesticides. The rubber farmer participants were asked to choose from a four-point Likert's scale ranging between always, often done, sometimes done, and never done. "Always done" meant farmers perform the dangerous protection activities from pesticides every time when they work with pesticides. "Often done" meant farmers almost perform the dangerous protection activities from pesticides when they work with pesticides or the time of doing activities are between 5-9 times from 10 times of using pesticides. "Sometimes done" meant farmers sometimes perform the dangerous protection activities from pesticides when their work related pesticides or the time amount of doing activity are not over 4 from 10 times of for using pesticides. "Never done" meant rubber farmers never perform the dangerous activities related to pesticide exposure. All individual points were sum up for a total score, means and standard deviations were calculated. Possible scores were ranged between 0.00-60.00 score. Scores of behavior regarding pesticide exposure classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60.00 % was low level, >60.00 % - 80.00 % moderate, and > 80.00 % high level. Examples of pesticide use behaviors include: checking tools and equipment before working; using expired pesticides; leaving food near or in the spraying area; conducting a breathing test to determine whether a pesticide is real or fake; discarding empty or expired pesticide containers in regular disposal areas.

The focus group discussion explored pesticide use in the Khogyang community, environmental health risks related to pesticide exposure, and recommendations for guidelines to improve pesticide safety in the Khogyang community. Examples of the focus group discussion guidelines included: What are rubber farmers' beliefs regarding the severity, susceptibility, barriers, and benefits of pesticide exposure? What observed work-related and socio-cultural factors modify pesticide exposure risks? What do rubber farmers need to reduce risk from pesticide in the Khogyang community? How can guidelines be established to reduce pesticide risk behaviors in Khogyang community?

3. Data analysis

Descriptive statistics including frequencies and percentages were used for demographic and occupational data. Means and Standard deviations were used for scoring, knowledge, belief and behavior related to occupational pesticide risk behaviors. Pearson's correlation was performed to evaluate knowledge, belief and behavior correlations (between knowledge and behavior, belief and behavior). Content analysis was used for the qualitative data. Qualitative data were analyzed by systematically organizing and interpreting information using categories. Patterns and relationships on which to base on analysis of the findings were identified. The data obtained were transcribed and crosschecked with rubber farmer participants before analyzing. The interview transcripts, debriefing summaries, and detailed field notes in their entirety were reviewed.

4. Results

4.1 Situation analysis study

The results revealed that a majority of rubber farmer participants were female (56.30%). The average age of the individuals was 48.13 years old. Most of them were married (85.90%). Most of them were primary school educated (62.20%). The average income was 9,697.18 baht per month. The average working with pesticide use was 9.58 years. Acute pesticides poisoning symptoms mostly found in the Khogyang community included: skin rash, headache, fatigue nausea, dizziness, skin irritation, nasal irritation, weakness and eye irritation. Most of the rubber farmer participants reported using products containing “glyphosate” as active ingredient. The next most frequently used active ingredient was “organophosphate”.

Risk behaviors related to pesticide use in the Khogyang community were: the lack of attention to safety environmental hazards, precautions, understanding the label given, and protective equipments and appropriate clothing during handling of pesticides. The rubber farmers often sprayed pesticide during strong winds. They mixed often pesticides without safety rubber gloves. They also poured pesticides directly into a spray tank without rubber gloves. They stored the pesticide equipments in their houses, where their children were able to access the storage area. This storage area was often close to other household activities and where the children were able to access (Figure 1).

Figure 1. Risk behaviors regarding pesticide use in Khogyang community, Trang, Thailand (Photo by SCHT students, 2012)

The results revealed that knowledge of rubber farmer participants on pesticide use was observed at low level (average score = 11.82 $\pm$ 3.33, total score = 21.00). The level of overall belief regarding pesticide use was observed at moderate level (3.57 $\pm$ 0.40, total score = 5.00). Behavior of rubber farmer participants on pesticide use was also observed at moderate level (average score = 2.87.42 ± 0.40, total score = 4.00). Positive statistically significant correlations between belief and behavior (r = 0.47) was found (Table 1).

Table 1. Correlations between knowledge, belief and behavior on pesticide use

		Belief	Knowledge	Behavior
Belief	Pearson Correlation	1	0.228	0.464^{**}
	Sig. (2-tailed)		0.056	<0.001
	N	71	71	71
Knowledge	Pearson Correlation	0.228	1	0.211
	Sig. (2-tailed)	0.056		0.078
	N	71	71	71
Behavior	Pearson Correlation	0.464^{**}	0.211	1
	Sig. (2-tailed)	<0.001	0.078	
	N	71	71	71

**. Correlation is significant at the 0.01 level (2-tailed).

4.2 Model development phase

The contents of the Khogyang community based participatory model included: (1) pesticide safety education delivery at home; and (2) community-based participatory action activities addressed pesticide safety behaviors (pesticide safety behaviors drawing contest; pesticide safety community forums; and Khogyang advisory committee engagement). The model was developed to improve health safety and prevention from pesticide hazards among rubber farmers in the Khogyang community. Research team and Khogyang community leaders set theme of pesticide safety behavior program focused on glyphosate use safety behaviors. Community-based participatory action project was performed in Khogyang sub-district, Kuntang district. Community-based participation activities included: discussions on priority concerns related to pesticide safety, problem-based, hands-on discovery learning from the home assessment. Participating households also received individual assessments from the healthcare staff for assistance with safer storage of pesticides, and discussions of improved hygienic practices, such as those associated with post-application wash-up and separate laundering of contaminate clothing. The Khogyang community module activities were provided during the next step including: the Khogyang community key person in-depth interview and focus group discussion; broad awareness-raising activities including: community module activities (created by the research team and Khogyang community key persons) including: Introduction to pesticides, Health risks associated with pesticide use, pesticide safe handling and use, safety and health in the use of pesticides, pesticide poisoning and management, environmental concerns, pesticide material production, pesticide safety material production (Figure 2). New materials, such as pesticide safety picture booklets, and posters were developed using ideas from the Khogyang rubber farmer participants.

Figure2. Pesticide safety education delivery at home; and community activities related pesticide safety behaviors

Figure 3. Examples of contents in picture booklet

The contents of the booklets involved and focused on basic guidelines for protecting rubber farmers from pesticide harmful. These booklets were distributed to all rubber farmer participants. These were also provided in the Khogyang sub-district administrative organization and Khogyang Health Promotion Hospital. The contents in the booklets used language was easy to understand. The drawing pictures in the booklets come up with the Khogyang community rubber farmer's ideas (Figure 3).

5. Discussion and Conclusion

Understanding health risk behaviors regarding pesticide use can help establish relationships between health problems from pesticide exposure and other health conditions. These lead to the setting of priorities which guided the focus of the intervention program and the development and resource utilization that made possible the delineation of responsibilities between different professionals, organizations and agricultural agencies in Trang. These findings are consistent with Raksanam B. et al (2012); and Chalermphol, J. and Genesh P. & Shivakoti (2009) studies. They found that major risk factors related to agrochemical exposure resulted from the misuse of pesticides, including erroneous beliefs of farmers regarding pesticide toxicity, the use of faulty spraying equipment, the lack of proper maintenance of spraying equipment. An intervention program is necessary to improve farmer safety. These findings are also consistent with previous studies (Sorat, W., 2004; and Farahat, T.M., Farahat, F.M. and Michael, A.A. 2009; Salvatore, A.L. et al, 2008; Samples, J. et al., 2009).

The Khogyang community Public policies should be developed to encourage farmers to change their pest management methods from pesticides. Although, the pesticide safety campaign in Thailand was launched in many years, they have been used by Thai farmers including the Khogyang rubber farmers. However, it's very hard to regulate and control pesticide use among the rubber famers in the Khogyang community, positive motivation activities regarding pesticide safety behaviors should be recommended in the Khogyang community. The strength of this Health Belief Model framework was specification of distinct research phases to identify a health problem and those behaviors that impacted on improving pesticide safety, to identify modifiable behaviors and environmental factors, and to specify factors that predisposed rubber farmers to change their behaviors, reinforce behavior change and enable positive behaviors related reducing pesticide risk behaviors. Using the questionnaires to measure the risk behaviors regarding to using pesticides might not accurately reflect the actual behaviors of the farmer participants. It is necessary to monitor changes of knowledge, belief, and behavior related pesticide use in next six months.

It is proposed that, this model may benefit other vulnerable groups such as maize farmers, orange and chili farmers. However, the researcher needs to be aware and sensitive to variations in belief systems and behaviors across different regions. To sustain the intervention, collaboration with the Khogyang community partners and local authorities is needed. In addition, when the Khogyang community members become closely involved with implementation of the study project, they became members of the research team and shared in the responsibility for the results and ultimately the effectiveness of the study.

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