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Full Length Research Paper

Development of Communication Program to Reduce the Pesticides Exposure among School Children in Highland Agricultural Communities, Chiang Mai Province, Thailand

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Many ethnic tribes living in the highlands of Thailand mainly composed of agricultural chemicals on farm workers. The present study was to focuses on the health of children, as they are likely to be exposed to pesticides in their environment. The purpose of present study was to develop a communications program to reduce the negative effects of exposure to pesticides of schoolchildren. Two ethnic hill tribe groups were studied. There were Hmong (50.5%) and Karen (43.9%) covered 198 children, aged range 11-12 years, the research consists of studying the life of their family, screening on expose to organophosphate and carbamate pesticides by using enzyme cholinesterase tested in finger blood plasma. The school children were assessed of knowledge, learning activities and an evaluation. The study found, almost students take help families when their work both in the field and/or at-home. The cholinesterase screening test found 52.9% were exposed to organophosphate and carbamate pesticides at levels unsafe. Learning programs that have been developed and applied in the context of lifestyle related. Short and clear message about pesticides and their toxicity had been developed and transmitted to children through learning how to act. It was found that the answers five questions related to the knowledge about the health effects of pesticides and the environment has changed. In addition, children are encouraged to present their understanding of the knowledge acquired their new show by drawing posters moppets and maintenance of notebooks.

Keywords: Learning model, pesticides, school children, highland agricultural community, Chiang Mai, hill tribes

INTRODUCTION

Chiang Mai Province locate on Northern part of Thailand, the most of people are farmer. In the current agricultural are still used pesticides for crop protecting and to reduce yield losses caused by pests. Although, they are already know that pesticides are harmful to themselves and their

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families, and if they are used too much, it may cause environmental problems. The previous studies reported that the acute and chronic health effects may from pesticide while consume contaminated water and food (Younes *et al.* 2000; Quackenbush *et al*., 2006; Boobis *et al*., 2008).

Highland communities in Chiang Mai province are located at about 800 -1500 meters above sea level. They mainly comprise of such tribes as the Karen, the Hmong, the Yao, the Lisu, the Lahu, the Lawa and the Akha. The major activities relate to family-based agriculture during which pesticides for growing vegetables and fruits are used (Schreinemachers *et al*., 2011). School children in these highland communities live in areas where these pesticides are used and have thus a high chance to be exposed (UNEP, 2004). Exposure is particularly the case with those children who regularly participate in family-based agricultural activities and, in addition, consume treated farm produce such as vegetables (Panuwet *et al*., 2009).

This research more particularly investigates the risk of the use of pesticides on the health and environment of Karen and Hmong children in four districts of Chiang Mai province, i.e. in Jom Thong, Hod, Mae Wang and Mae Rim, in order to obtain a better understanding of their health and environment. The results of this study should lead to better health protection and a larger common understanding of the health risks within the respective families. In addition, the related impact on the environment and ecology were assessed.

MATERIALS AND METHODS

Study design: The present study involved 198 primary school children from 6 schools i.e. the Baan Khunklang School, the Niyompraiphamhon School, the Baan Khunpae School in Jom Thong district; the Baan Mae Tho School in Hod district; the Baan Huaytong School in Mae Wang district and the Chaomaeluanguppathum School in Mae Rim district. The project was conducted from October 2008 to December 2009.

Formative research: This formative research was carried out by using mixed methods, such as interviews, documents and field observations. The objective was to clarify and better understand the social and cultural life, the related lifestyles, the visual aid approach and the environment of the school children involved. In addition, a better insight was to be obtained of common health knowledge and the environmental impact of pesticides exposure.

Risk assessment for raising awareness of pesticides impact on children's health: In order to determine cholinesterase levels, finger blood test screenings of school children were taken using reactive paper. The reactive paper is designed for organophosphate and carbamate pesticide. The Government Pharmaceutical Organization of Thailand provided the required test kits. Four different colours were used in order to determine the change in cholinesterase activity. The following norms (in terms of units per ml) were used to determine the cholinesterase status, when the reactive paper does not change the colour, the result as normal (≥ 100 units/ml), yellow colour as safe (87.5– 99.9 units/ml), green colour as risky (75.0-87.4 units/ml), and blue-green as unsafe (<75.0 units/ml), (Occupational Health section, 1997). These measurements were taken before and after the learning program in order to assess a change of health risk due to pesticide exposure.

The learning programs and implementation: The programs and implementation were designed within the context of the school children's daily lives. Much importance was given to the development of short and clear messages for use in an action-oriented learning program. Attention was also given to the creation of an appropriate social environment, with focus on the teachers' and parents' understanding of the risk of pesticides use in school children. For that reason, the activities conducted included meetings with the schoolteachers and the parents. In addition, a workshop with and for the teachers was conducted to make them understand the objectives of the project, their participatory roles, whilst training was received on making use of easy handmade media that could be used for the children particularly. Finally, the learning activities with children in each school which comprised of: 1) drawing body maps that indicate areas of pesticides exposure; 2) experiments on fruits and vegetables to expose pesticides contamination; 3) poster drawing; 4) maintaining notebooks and, 5) Muppet shows.

The evaluation was done using pre and post-test questionnaires, including feedback from the children's presentations, such as body maps, poster drawing, diary notebooks and Muppet shows.

Ethical Approval

The study was approved by Human Experimentation Committee (HEC), The Office of Research Ethics, Research Institute of Health Sciences, Chiang Mai University. In particular, the participation of the parents and students in the research activities was endorsed.

RESULTS

Study participants: The demographical data were shown in table 1. A total of 198 school children participated of which 92 were male (46.5%) and 106 female (53.5%). Most of them were from a Hmong (50.5%) and Karen (43.9%) and had aged range from 11 to 12 years (84.9%).

Pesticides exposure among school children: The data from questionnaire about parent's career and their time helping family in the fields (table 1) show most school

Table 1: Demographical data of study participants

Data	Number (%) (n = 198)
Sex	
Male	92 (46.5)
Female	106 (53.5)
Age (year)	
10	12 (6.0)
11	117 (59.1)
12	51 (25.8)
13	12 (6.1)
14	6 (3.0)
Hill tripe	
Hmong	100 (50.5)
Karen	87 (43.9)
Others	11 (5.6)
Parent's career	
Farmer	193 (97.5)
Non-farmer	2 (1)
School children working in the field	
Yes	182 (92)
No	15 (7.6)

Table 2: Numbers and Percentages of Students responding to statements on the impact of agricultural chemicals on health and environment, before and after the communicative process.

Statements	Number of correct answers (in percentages)	
	Before (n=198)	After (n=187)
1. Pesticides cause damage to insect pests only	94 (47.5)	159 (85.5)
2. Pesticides cause insects, birds and butterflies to die	129 (65.2)	155 (82.9)
3. Pesticides cause damaged to soil water and air	128 (64.6)	152 (81.3)
4. The body is exposed to pesticides through mouth, nose and skin	148 (74.7)	171 (91.4)
5. Chemical residues in the body may cause cancer	148 (74.7)	159 (85)

children spent their time to help in field such as weeding, harvesting

Knowledge of pesticides impact on health and environment: The pre and post-test questionnaires revealed that the answers to four out of five statements on knowledge of pesticides impact on health and environment of school children were shown in table 2. Most of them knew the pesticides can be up taken to the body through mouth, nose and skin and may cause cancer at 74.7%.

Cholinesterase levels among school children in study areas as identified through blood screening tests: The cholinesterase level from rapid test show risky levels at the highest, and safe, normal and unsafe level, respectively (Figure 2). After the school children joined the communication education program, the risky level numbers had decreased but unsafe level was higher than that before.

DISCUSSIONS

Most of school children participated in present study were Hmong and Karen. They family live on mountain, good weather, cold and suitable for crop growing such vegetable and fruit. So that, they need to gain income and more products, they used much more pesticide in their field.

Figure 1: A. Group drawing a poster to clarify exposure of human bodies of pesticides, B. Clarifying the impact of pesticides through a Muppet show, C. Clarifying risk of pesticide exposure based on blood test results, D. Students' drawing of the home environment.

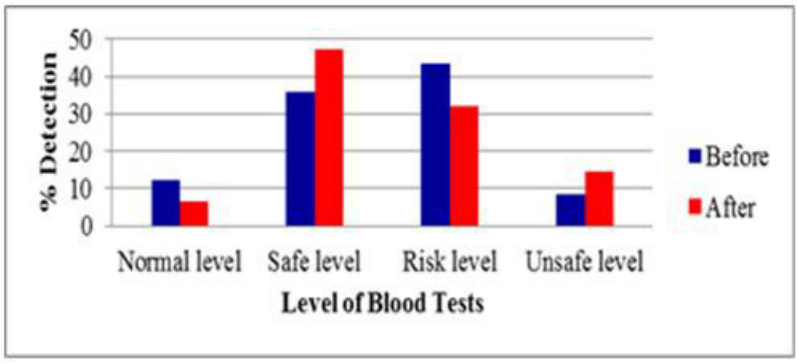

Figure 2: Levels of blood tests for screening organophosphate and carbamate exposure of school children before and after a communication Education Program.

Cholinesterase enzyme is the biomarker of oranophosphate and carbamate exposure (Hongsibsong *et al*., 2015), these pesticides may affect the development of children after they got high exposure and may be related to respiratory disease in children through dysregulation of the autonomic nervous system (Eskenazi *et al*., 1999; Grandjean *et al*., 2006). The present studied show that children were also exposed with pesticides used as pest control because they spend some time to help their family in the field. In addition, the school children had chance to expose those pesticides because they live in contaminated environment so good knowledge and good protection very important for them (Sapbamrer *et al*., 2010).

The knowledge of pesticides impact on health and environment of school children had changed significantly following a communicative training process (0.005). Moreover, the school children could give evidence of their new knowledge and awareness through poster drawings, the showing of Muppet they made, and their notebooks so that the risky level of cholinesterase test had lower than before.

The present studied were used poster drawing and handmade Muppet as tools for communicating to reduce the pesticides exposure among school children, so the tool which held from participant, easy, clear content and suit with their community could be used as good tool for buildup awareness and reducing pesticides use. This study confirmed findings from the study of Raksanam and Songthap (2015) that develop E-book as a good tool with simplified language styles, fonts, layouts, and good designs among children living in rubber farming at Southern part of Thailand and those community gained more knowledge and took the necessary steps to incorporate pesticide safety.

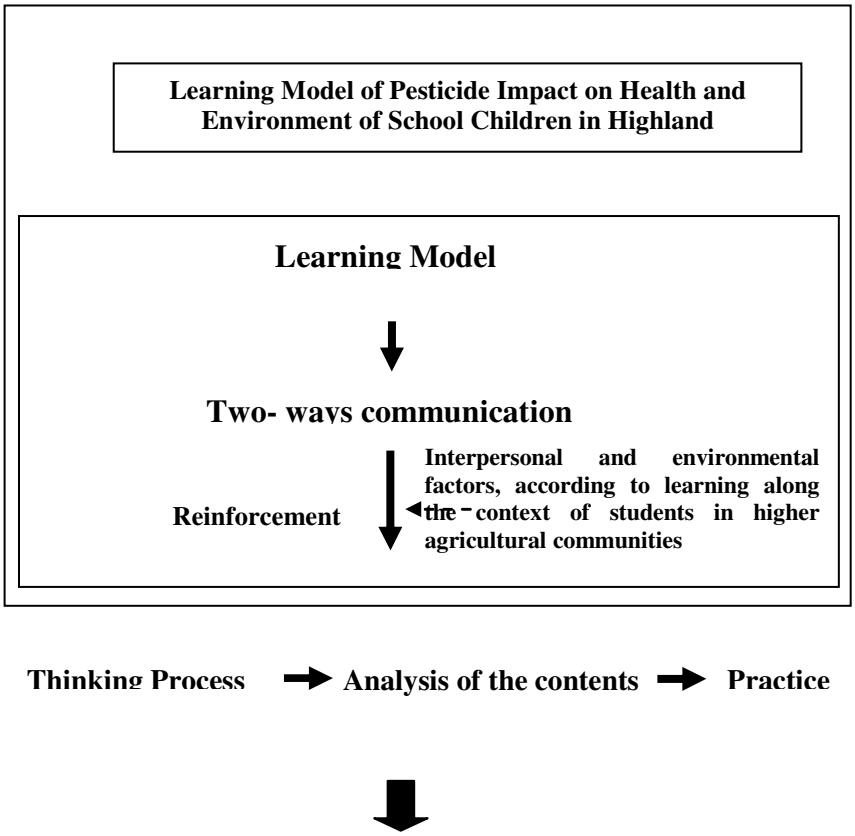

Figure 3: Learning Model of Pesticide Impact on Health and Environment of School Children in Highland Agricultural Communities

The school children are good group for giving information about toxicity and effect of pesticide to human health and environment. The previous report show relation between knowledge and educational status among farmers who received school education had higher levels of knowledge than those who did not (Al-zain and Mosalami, 2014).

However, the level of cholinesterase by screening test shows the level of unsafe levels had higher than before the learning program, which means that more biological factors were involved and a longer intervention program may be needed (WHO, 2008).

CONCLUSIONS

This project has shown that a successful learning model to convey the impact of pesticides on the health of highland school children is a two-way communication approach with short and clear messages that the children understand through action-oriented learning. It is of utmost importance that the teachers, if not any person who may undertake a similar learning program, take into account the environmental and natural context in which the children live. Based on this principle, the messages and design of the learning model can be made using an action-oriented learning approach so that the children have a chance to think and act themselves, rather than giving them information only in the classroom, as shown in Figure 3.

The children reported that they had good experience with the learning program and now much better understood the impact of pesticides on health and environment; moreover, they did not want their parents to be affected by pesticides. The problem that arises is how can they keep their vegetables free from pests whilst guaranteeing a family income if they do NOT use pesticides. It is hoped that the results of this research will be to the benefit of all children so that they can become safeguarded from the impact of pesticides on their health and environment.

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