PERCEPTION ABOUT HEALTH RISK AND HEALTH PROTECTION FROM CROPS AND FOREST FIRE SMOKE AMONG HIGH SCHOOL STUDENTS IN NAN PROVINCE, THAILAND

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ABSTRACT:

Background: The study was carried out among high school students in Nan Province, Thailand with the objective of determining the current situation of receiving information, perception, and health protection of crops and forest fire smoke.

Methods: Two hundred and seventy eight students were randomly selected and provided with self-administrated questionnaire.

Results: About 60% of the students were female. The mean age was 16.1±1.7 years. Nearly 65% were studying in senior high school level. The public information sources such as television, local radio, newspaper, and advertisement were the most common sources which the respondents used to receive the crops and forest fire smoke information. Most students had sometimes received all items of information about crops and forest fire smoke. They had moderate level of receiving information (mean score = 19.2±4.3) and moderate level of perception (mean score = 27.0±4.2). Most students had moderate of health protection (mean score = 6.5±2.2) and they used all of the health protection measures to protect them from the crops and forest fire smoke including resident environmental adaptation; personal lifestyle modification; and community participation. This study found that health protection was significantly associated with studying level ($p < 0.05$), receiving information ($p < 0.05$), and perception ($p < 0.001$). Moreover the perception was significantly associated with receiving information ($p < 0.05$). Receiving information was the important factor of increasing the health risk perception and health protection from crops and forest fire smoke among the high school student. Health risk perception was the most important factor of health protection to avoiding and reducing the crops and forest fire smoke exposure.

Conclusions: Therefore, increasing the received information need to be developed to make the perception which in turn will influence students to modify their behavior.

Keywords: Perception, Health risk, Health protection, Crops and forest fire smoke, High school student, Thailand

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INTRODUCTION

Northern Thailand Provinces are included Chiang Mai, Lumpang, Lumphun, Mae Hong Son, Chiang Rai, Phayao, Nan, Phrae and Tak. The number of crops and forest fire occurring across Northern Thailand has increased mainly during January to April since 2007 [1] that has been recognized as the haze crisis. The areas of crops and forest burning have detrimental impacts on economies, human health and safety, with consequences comparable in severity to other major natural hazard [2, 3]. Although, the fire and smoke problems have been solved by the several Ministers of Thailand and local governments since 2007 [3]. Crop and forest fires can be predicted, controlled and, prevented through the implementation of appropriate policies. The development of policies and guidelines to reduce the health impacts of smoke generated from burning crops must be linked with policies that address the smoke problem at its source [4].

Nan Province is one of nine Northern Provinces, where crops and forest fire smoke problems occur and the province is also the poverty

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province [5], eighty-five percent of occupation is agriculture. Up to 87 percent of its area of 11,472 km^2 is heavily forested with mountainous terrain, leaving only 12 percent for agriculture and 1 percent for residential [6]. The smoke episode of Nan Province has several causes of burning, such as; forest fire (natural cause); conversion of forest to new agricultural land [7]; burning of agricultural residues [8]; and prescribed burning in forestry. Moreover, the smokes in Nan are from the transportation air pollution in Southeast Asia Region [9]. Crops and forest fire smoke had emerged as an important public health problem in Nan Province as it has become endemic throughout the country. The total number of cases recorded, Nan Hospital reported the number of people greater than 8,000 persons came to hospital with asthma and other respiratory disease, average 300 persons per day in March 2013 [10]. The Nan Provincial Government had annual action plan to stop burning and decrease the environment and health effects of the smoke such as plan to stop burning; air quality monitoring; health surveillance; public notification; and public education [11].

The high school students in Nan province were the group of population whose chance to be affected by the smoke hazard. They can receive the information from the common public information source and from special source in the school education system [12]. This study aims to determine the current state of receiving information, perception, and health protection from crops and forest fire smoke of the high school students. Associations between health protection and socio-demographic characteristic, receiving information, and perception were assessed in this study. The result can indicate the action of local government in providing effective ways of raising perception and health protection of crops and forest fire among young people.

MATERIALS AND METHOD

Nuntaburivittaya School in Nan Province was purposive selected. The coeducational school and the students are native from several tribes and live in districts around Nan Province. 278 students in this school were selected by random sampling. The questionnaire which approved by with 3 experts (Index of Item Objective Congruence (IOC) was 0.6) were used for data collection by self-administrative in April 2014. The licensed SPSS version 17 for windows was used. The descriptive statistics and Chi-square test were used to find an association between independent and dependent variables. This study was approved by the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (COA No. 058/2557)

RESULTS

The socio-demographic characteristics of a total 278 respondents in this study (35.6% male and 64.4% female), their average age was 16.1±1.7 year old. Most of them (52.2%) were lived in Muang Nan District. There were the senior high school level (64.7%) and junior high school level (35.5%). About 49.6% of them had less than 5,000 baht of monthly family income. In the last 3 month, 58.6% of them have burned anything in their house area and 22.7% have burned agricultural residues.

Table 1 showed the result of information receiving, information source, and perception about crops and forest fire smoke. The highest frequently receiving information was item of the forbiddance of burning in forest, agricultural land, and community (36.7%) of the students as mean 2.2. Following, using mark to reduce the smoke exposure when living in air pollution (mean = 2.0), and the health effects of crops and forest fire smoke such as skin irritation, eye irritation, respiratory and cardiovascular illnesses (mean = 2.0). Nearly 15% of the students had never gotten the suggestion to following the information about crops and forest fire. About 42.4% of the students frequently used the public information source (television, local radio, newspaper, and advertisement) to receive the crops and forest fire smoke information. About 51% of them had sometimes received the information from the school education including classroom learning and school activities such as broadcast, poster, outdoor space activity.

Most students perceived the causes of the smoke during January to April are burning in forest, agriculture land, and community areas (63.3%). They had the good understand about environmental effect including crops and forest fire smoke can cause of dim weather (63.3%), and decreasing visibility (62.9%). For the perception of health effect, they know that the crops and forest fire smoke can cause respiratory symptoms (65.8%); skin irritation (56.5%); and eye irritation (63.7%). The students know that the children (56.5%), the elderly (51.8%) and the people with heart or lung diseases (54.7%) were susceptible populations of the smoke. Less than half students perceived that smoke from crops and forest fires didn't affect their life (47.5%), and they had not sure that the danger of smoke from crops and forest burning compared with danger of air pollution from other sources (48.6%).

Table 2 showed that staying inside the clean resident was the most used measures for the students

Table 1 Percentage of the respondents by the received information, information sources and perception on individual item

Item	Percentage (%) (n=278)				$\bar{X}$ ± SD
Received information	**0 Never**	**1 Occasionally**	**2 Sometimes**	**3 Frequently**	
• The smoke during January and April is increased from open burning	5.0	18.7	64.7	11.5	1.8±.7
• The smoke can cause some health effects such as skin and eye irritation, respiratory and cardiovascular illnesses	5.0	17.3	50.7	27.0	2.0 ±.8
• The susceptible populations of smoke include people with respiratory and cardiovascular disease, children, and elderly	5.4	21.9	46.8	25.9	1.9±.8
• The information about crops and forest fire smoke such as air quality monitoring, health impacts, and mitigation measures	15.5	28.1	44.6	11.9	1.5±.9
• The reduction of the smoke by residential management	4.7	19.4	49.3	26.6	2.0±.8
• The avoidance and reduction of smoke by lifestyle modification	5.4	20.1	48.2	26.3	1.9±.8
• Reduction of smoke when living in pollution by using mask	2.2	17.6	56.1	24.1	2.0±.7
• Forbiddance of burning in forest, agricultural land, and community	1.1	16.2	46.0	36.7	2.2±.7
• Fire monitoring, and air quality monitoring of Nan Province	3.2	19.4	60.5	16.9	1.9±.7
• Measurement of avoidance and reduction of smoke-related air quality	1.1	24.8	60.8	13.3	1.9±.6
Source of information	**0 Never**	**1 Occasionally**	**2 Sometimes**	**3 Frequently**	
• Campaigns consist of local, district and province events	6.8	27.7	49.3	16.2	1.8±.8
• Classroom learning	2.2	27.7	51.4	18.7	1.9±.7
• School activities such as broadcast, poster, outdoor space activity	4.0	22.7	51.1	22.3	1.9±.8
• Village source such as broadcast, poster in village hall or temple	4.3	23.7	47.1	24.8	1.9±.8
• Human source such as friend, family, village health volunteer	7.2	27.0	46.0	19.8	1.8±.8
• Public source such as television, radio, newspaper.	2.2	14.7	40.6	42.4	2.2±.8
• Internet source such as website, social network	12.2	21.9	42.1	23.7	1.8±.9
Perception	**3 Agree**	**2 Not sure**	**1 Disagree**		
• The causes of the smoke in Nan Province.	63.3	25.9	10.8		2.5±.7
• Crops and forest fire smoke can cause dim weather	63.3	29.1	7.6		2.6±.6
• Crops and forest fire smoke can decrease visibility	62.9	29.5	7.6		2.6±.7
• The crops and forest fire smoke can cause the respiratory symptoms such as difficulty breathing, coughing, and sore throat	65.8	27.7	6.5		2.6±.6
• The crops and forest fire smoke can cause skin irritation	56.5	37.1	6.5		2.5±.6
• The crops and forest fire smoke can cause eye irritation	63.7	31.7	4.7		2.6±.6
• The children are the susceptible population to the crops and forest fire smoke	56.5	38.5	5.0		2.5±.6
• The elderly are the susceptible population to the crops and forest fire smoke	51.8	43.2	5.0		2.5±.6
• The people with heart or lung diseases are the susceptible population to the crops and forest fire smoke	54.7	40.3	5.0		2.5±.6
• Smoke from crops and forest fires doesn't affect your life	23.4	29.1	47.5		2.2±.8
• Forest fire smoke is less dangerous compared to air pollution from other sources	25.5	48.6	25.9		2.0±.7

Table 2 Number and percentage of respondents by health protection against crops and forest fire smoke exposure

Health protection measures	n	%
• Using domestic air conditioner	36	12.9
• Closing the windows, door	196	70.5
• Spraying water around resident	126	45.3
• Avoiding indoor burning	188	67.6
• Avoiding the outdoor burning around the residential area	194	69.8
• Checking the information	160	57.6
• Staying inside the clean resident	203	73.0
• Leaving or evacuating from the high smoke concentration area	192	69.1
• Using dust mask	185	66.5
• Participating in management of fire	156	56.1
• Participating with community in campaign regarding protection from smoke	178	64.0

Table 3 Receiving information, Perception, Health protection

Groups	Score	N	%	Mean	S.D.
Receiving information				**19.2**	**4.3**
Low	5 – 15	53	19.1		
Moderate	16 – 24	197	70.9		
High	25 – 30	28	10.1		
Perception				**27.0**	**4.2**
Low	11 – 22	49	17.6		
Moderate	23 – 29	195	70.2		
High	30 – 33	34	12.2		
Health protection				**6.5**	**2.2**
Low	1-4	43	15.5		
Moderate	5– 9	202	72.6		
High	10-11	33	11.9		

to protect them from the smoke exposure (73.0%). This measure was followed by closing the windows, door (70.5%), and avoiding outdoor burning (69.8%). The use of domestic air conditioner was the least used measure among the respondents in reducing the smoke exposure (12.9%).

The range of received information scores was 5 through 30 for a total of 30 scores. The range of student's perception score was 11 through 33 for a total of 33 scores. For health protection scores, the score range was 1 through 11 of 11 scores. The average score of received information, perception, and health protection was 19.2, 27.0, and 6.5, respectively. The level of received information, perception, and health protection were classified by mean ± SD into 3 groups: low level (<mean – SD), moderate level (range of mean ± SD), and high level (>mean + SD). The result revealed that receiving information was of moderate level (70.9%) from 16 – 24 scores. Most of students possessed a moderate perception (70.2%). Scores of moderate perception were 23 to 29. Health protection same as perception, indicated that the majority of students got moderate level (72.6%) at 5-9 score. Each level was shown in Table 3.

The association between independent variables (socio-demographic characteristics, received information, and perception) and dependent variable (health protection) was tested by chi-square test. This study found that there was no statistically significant association between the socio-demographic characteristics and the level of health protection except the studying level. The junior students had higher protective themselves from the smoke than the senior students. The result of association between studying level and level of health protection was $\chi 2 = 4.355$, $p < 0.05$.

According to Table 3 the score of receiving information, perception, and health protection were defined to distinguish low, moderate and high score groups. In this way the student that have low and high score is very small number. Therefor investigation the associations of receiving information, perception, and health protection, the score were divided to 2 groups: Less than, or equal to mean (≤ mean) and Greater than mean (> mean).

The association between receiving information and health protection was statistically significant (*p-value* <0.05), higher level of receiving information showed better health protection. On the other hand, the association between receiving information and perception was statistically significant ($p < 0.05$), most students had higher level of receiving information and got better level of

Table 4 Association between receiving information, health protection and perception

Variables	Health protection			Perception		
	Less than, or equal to mean (≤ 7) No. (%)	Greater than mean (>7) No. (%)	Total No. (%)	Less than, or equal to mean (≤ 27) No. (%)	Greater than mean (>27) No. (%)	Total No. (%)
Receiving information						
Less than, or equal to mean (≤ 19)	84 (76.4)	26 (23.6)	110 (100.0)	63 (57.3)	47 (42.7)	110(100.0)
Greater than mean (>19)	108 (64.3)	60 (35.7)	168 (100.0)	70 (41.7)	98 (58.3)	168(100.0)
Total	192 (69.1)	86 (30.9)	278 (100.0)	192 (69.1)	86 (30.9)	278(100.0)
	$\chi 2 = 4.593$ df = (1) *p-value* < 0.05			$\chi^2 = 6.488$ df = (1) *p-value* < 0.05		
Perception						
Less than, or equal to mean (≤ 27)	106 (79.7)	27 (20.3)	133 (100.0)			
Greater than mean (>27)	86 (59.3)	59 (40.7)	145 (100.0)			
Total	192 (69.1)	86 (30.9)	278 (100.0)			
	$\chi 2 = 13.497$ df = (1) *p-value* < 0.001					

perception (98 respondents, 58.3%). Furthermore, the perception was statistically significant with health protection at the $\chi^2 = 13.497$, $p<0.001$. The result suggested that the higher level of perception was associated with better health protection (Table 4).

DISCUSSION

The item of information in this study was implemented according to some international guidelines for crops and forest fire smoke exposure [6, 13-15]. Without observation the current messages that local government had given to public in Nan Provinces, that the students had sometimes received all of the information items. This result showed that Nan Provincial government gave the important messages covering the knowledge and notification which public should know. However, the researcher has to collect the secondary data about the current public relations of Nan government including the message, channel, and frequency to finding the linked of the giving information from government and the receiving information of students.

This finding was consistent with the finding from the study of Macey which found out that television was the highest ranking information source for the respondents [16]. It because of there had more enough number of sources and easy to following the information. Audio and television have unparalleled ability to disseminate information to virtually every household [17]. The governor should create some types of audio and video production varies by length, distribution channels and professionalism of production such as short radio and television public service announcements (spots); short audio and video podcasts; and longer audio and video productions.

The information source concerning internet transfer such as web page (web sites) was the information source that most of the students never used to receive the information. It need cost to access the internet data. Although, web resource was the one of simple and inexpensive way to promote public perception for environmental health risk reduction [18] the family income of students may be impact to limited accessing the web resource. However, the social network was the common channel to connection in current year [18]. Developing the easy to understand messages and tools may make the information more convenient to follow education and notification from both free cellular network data such as SMS, early warning and internet source on Facebook, and smart phone applications such as Line, What's app.

This study found that information receiving was the important factor that results for increasing the health risk perception and health protection from crop and forest fire smoke. Some studies found that people receiving information related to their health threat, less serious and accurate than people non receiving information [19]. People who are informed that they have risks try to minimize the seriousness of the health threat and derogate the risk factor in order to maintain a favorable sense of their health [20].

The studying level had significant association with the level of personal health protection. Regarding health protection level of junior was higher than the senior high school students, especially in the item of community participation. One reason may was the maintained by school and provincial government, which includes classroom learning and school activities during school time at school, as this might tend to restrict the development of an individual's sense of responsibility in students.

Entrance to junior high school generally marks the beginning of critical developmental and transitional stages. During this period of transition into adolescence, many children develop beliefs regarding health effect of crops and forest fire smoke, along with a decrease in their individual sense of value, self-extreme, and sociability, which occurs with increasing age [21].

The perception was the most important independent variable of health protection. The students with high perception who had an awareness of dangers of crops and forest fire, therefore they had to avoid and reduce the smoke exposure before it can destroy their health. This result was consisted with the results from the studies of environmental health risk perception on practice, which found risk perception was the important factor of public reaction to environmental exposures [22].

CONCLUSION

Receiving information was the important factor of increasing the health risk perception and health protection from crops and forest fire smoke among the high school student. Health risk perception was the most important factor of health protection to avoiding and reducing the crops and forest fire smoke exposure. Therefore, increasing the receiving information need to be developed to make the perception which in turn will influence students to modify their behavior. For this reason the increased perception might bring futher benefits to the community and this highly beneficial process will continue every year.

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