

Health Impacts from Air Pollution in Border Community of Thailand-Myanmar

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Received August 21, 2023
Accepted October 27, 2023
Published December 31, 2023

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ABSTRACT

Introduction: Health impacts from air pollution are a major health challenge for people living in border areas in northern Thailand particularly those who live in Mae Sai District, Chiang Rai. The study aimed to assess the health impacts of air pollution among people living in the border community of Thailand-Myanmar.

Methods: The mixed-method study was applied to collect data from selected people living in Wiang Phang Kham sub-district, Mae Sai District, Chiang Rai Province. Data were collected by a validated questionnaire, in-depth interview, and group discussion between August 2022 to March 2023.

Results: A total of 404 participants were randomly selected for the study in the quantitative phase. At the individual level, difficulty in breathing, chest tightness, and conjunctivitis, especially in the elderly were reported. Stress and anxiety from lack of income were detected. Moreover, being unable to work was the majority of issues reported among the working-age. A large number of people who had health problems related to poor air pollution were reported. Finally, non-effective policies implemented indirectly affect people's health. Avoiding outdoor activities, trade, and agriculture were immediately effective measures.

Conclusion: Poor air pollution impacts directly on those people suffering from health, especially among patients related to respiratory diseases including children and the elderly. It urgently needs national and international collaboration to improve poor air quality in northern Thailand.

Keywords: Health Impacts, Air pollution, Border Community, PM2.5

Introduction

Air pollution is not only caused by smog but also by the contamination of indoor or outdoor environmental burnings, leading to the poor quality of the atmosphere [1]. Almost all people who are living in countries related to agricultural sectors are facing poor air quality or air pollution. After exposure for a long time, people develop health issues due to air pollution problems. The particle matter of 2.5 microns is a major source of health problems in humans especially exceeding the standard level [1]. There are four major health problems caused by PM 2.5: (i) cardiovascular disease; (ii) respiratory system diseases; (iii) dermatitis, and (iv) conjunctivitis [2].

The major high-risk populations are young children, the elderly, pregnant women, congenital diseases such as heart disease, stroke, pulmonary diseases, asthma, allergies, etc [1]. For those people who have some medical conditions, exposure the PM2.5 could develop a severe stage and require intensive

medical care [1]. Air pollution across borders is one of the significant issues for people who live in border areas which means that if an open burning in neighboring countries, people living in Thailand could get a serious impact [3].

The Department of Air Pollutions Control, Thailand reported that March 2023 was the month that had severe air pollution in northern Thailand compared to previous years [4], particularly the 24-hour PM2.5 level which was higher than the standard at 170 micrograms per cubic meter. In 2023, the PM2.5 value of

Wiang Phang Kham Subdistrict, Mae Sai District, Chiang Rai Province which is the border areas of Thailand and Myanmar, had reached the highest PM2.5 level at 586 micrograms per cubic meter which was the highest area in Thailand and is considered to have a significant impact on health [4, 5]. The problem has been detected and concerned for many years without

any effective implementation implemented to address the problem, and a large number of people have been observed in their health from the consequence of poor air quality in the areas [5]. Wiang Phang Kham Sub-district is a special area surrounded by mountains and located on the border of Thailand and Myanmar a large of people live in the area. Moreover, the area is a favorite with people from outside Thailand to stay and work [3]. The majority of people living in this area are working in farming. Then the study aimed to assess the health impacts of poor air quality or air pollution on those who were living in border areas of Thailand- Myanmar particularly while people faced a long period of the problem from open burning from both internal and external countries.

Methodology

Study Design and Study Setting

A mixed-method design was applied. The study setting was the Wiang Phang Kham Sub-district border community area. Data were collected data between August 2022 and March 2023.

Sample Size Calculation

The sample size was calculated according Krejcie & Morgan (1970) formula [6]; $n = \frac{X^2 NP(1-P)}{e^2(N-1) + X^2 P(1-P)}$ where $X^2 = 3.841$ for 95%CI; P is proportion of the population ($P = 0.5$); e is acceptable tolerance level (0.05). A total of 365 samples were needed for the study. However, adding 10% for any error, 404 samples were required for the analysis.

Research Instruments

A questionnaire was developed and tested for its validity and reliability before use based on the literature review and application of the Department of Haze-related Health Behavior Assessment form [1]. The questionnaire was used to collect general information about the participants, illness information, awareness, and self-protection behaviors. The questionnaire was improved its quality by the item-objective congruence (IOC) method by three experts. The pilot test was carried out among 30 selected participants who had similar characteristics as the study population, and the alpha coefficient was found at 0.80,

Data Collection

Access to the villages and participants was granted by the district government officer. Health officers who were working at Mae Sai District and Mae Sai Hospital were further contacted for data collection. Villagers who met the inclusion and exclusion criteria were contacted for an interview five (5) days ahead. Before starting of data collection, all participants were explained the study objectives and the content required on a questionnaire. All participants signed on a written consent voluntary basis before the commencement of data collection. The in- depth interview lasted 20

minutes, and the focus group discussion took 45 minutes each.

Data Analysis

Descriptive statistics were used to describe the characteristics of the participants in the form of percentages and mean values. Thematic analysis was applied to analyze the qualitative based on the ecological and social concepts [7].

Ethical Considerations

The study protocols were approved by the Mae Fah Luang University Ethics Committee (No. EC 21250-18).

Results

The majority were Thai (96.29%), 57.92% were females, 39.60% were aged 40-49 years, and 47.03% were working as daily wage employees. Most of the participants graduated from primary school (35.40%), 48.02% had monthly income between 10,001-15,000 baht, and 59.16% lived in urban areas (Table 1).

Table 1 General characteristics of participants

Characteristics	n (404)	%
Sex		
Male	170	42.08
Female	234	57.92
Age (years)		
20 – 29	37	9.16
30 – 39	73	18.07
40 – 49	160	39.60
50 – 59	103	25.50
≥ 60	31	7.67
Occupation		
Farmer	163	40.35
Daily wage employee	190	47.03
Traders	28	6.93
Government officer	19	4.70
Private employees	4	0.99
Education		
No schooling	10	2.48
Primary school	143	35.40
Junior high school	117	28.96
High school	84	20.79
Diploma/university degree	50	12.38
Nationality		
Thai	389	96.29
Burmese	3	0.74
Laotian	3	0.74
Chinese	9	2.23
Monthly income (bath)		
<5,000	42	10.40
5,000 – 10,000	96	23.76
10,001 – 15,000	194	48.02
15,001 – 20,000	50	12.38

Characteristics	n (404)	%
>20,000	22	5.45
Residential area		
Forest areas	7	1.73
Agricultural areas	158	39.11
Urban community	239	59.16

The major health problem was difficulty breathing (62.87%) during facing poor air quality, and wearing mask (66.09%) was the key measure (Table 2).

Table 2 Health problems and preventive measures during having air pollution

Disease and preventive measures	n (404)	%
Symptoms during air pollution		
No symptom	37	9.16
Asthma	55	13.61
Itchy or burning skin	35	8.66
Difficulty breathing	254	62.87
Pneumonia	23	5.69
Preventive measures		
No prevention	95	23.51
Wearing mask	267	66.09
Avoid leaving the building	42	10.40

The findings from the thematic analysis, it was found that the impacts of poor quality of air or air pollution on the population in five (5) levels namely individual, interpersonal, organization, community, and public policy. (i) At the individual level, it was found that individuals were suffering from server illness and disease progression from air pollution. Most of the participants reported that several respiratory and eye-related diseases presented during the severe air pollution season including difficulty breathing, sore nose, sore throat, shortness of breath, chest tightness, and red eyes. Those with chronic obstructive pulmonary disease (COPD) reported having been more frequently to be hospitalized in the season. Those children and the elderly were the most vulnerable populations from exposure to poor air quality for illness development. (ii) On the interpersonal level, families with children and the elderly had more concern and impacted the air pollution in the season. The family had stress during the air pollution from concerning their family member getting an illness. (iii) At an organization level, the problem of poor air quality or air pollution led community leaders including people working in an organization to get stressed concerning their employees' health. Most people had been informed to avoid any outdoor activities to prevent the impacts. (iv) People living in a particular area had a high possibility of getting health problems during the peak of air pollution. Several patients related to poor air quality were presented in health institutes significantly. And (v)

public policy level, several public policies were developed and implemented during the high season of air pollution, however, many of the implementations had small positive effects on reducing the problem due to the origin of the problem was not properly addressed.

Discussion

Results of a study on health and social impacts from air pollution in villages along the Thai-Myanmar border which study based on the ecological model, categorized the impact into five (5) levels: individual, interpersonal, organization, community, and public policy. Several health impacts had been detected particularly respiratory and dermatology systems. The children and the elderly were the major vulnerable populations. Those who had medical conditions, particularly COPD patients had a higher frequency of being hospitalized during the peak of PM2.5. Several public policies and implementations were implemented, but they needed collaboration from people and organizations at local, national, and international levels to mitigate the problem for the people who lived in the border areas of Thailand and Myanmar.

The group of people who have underlying diseases related to the cardiovascular system, such as various types of heart disease and cerebrovascular disease, and people with underlying diseases related to respiratory diseases and allergies were at a greater risk of developing health problems from exposure to poor air quality or air pollution [8]. The problem also led to individuals and family member's stress and anxiety about getting illness to their family members [9]. The numbers of seeking medical care were related to the severity of the PM2.5 especially to those who had health problems related respiratory system [10].

At the community and policy levels, the health system of Thailand had spent a large amount of finance to support treatment and acre during the high PM2.5 significantly [5]. In 2016, more than 800 cases of severe illness related to PM2.5 were admitted to Chiang Rai Hospital [5]. More than 74,799 cases were reported in Chiang Mai Province which was one of the highest impacts on air pollution in Thailand in 2016 [5]. According to satellite surveys, it was found that Myanmar had the highest hotspots in the region, with 41% [10], and currently used as the major source of monitoring system between countries air pollution situation [11]. The problem has been clearly defined and it needs collaboration among countries' people and organizations to address the problem [12] including the participants of the people who live in the areas [13] to get the optimal effect of any measures.

One of the important that had been pointed oy from the study was the impact on the family income due to the inability to work outdoors [9]. A large amount of income is lost from the air population in the northern region of Thailand [14]. People who live in border areas

could be impacted by their family income from air pollution due to being unable to farm and reduce the number of tourists where are tourist destinations [18, 2], particularly in Songkran festival [15]. It was clear that the high PM_{2.5} impacted the income from tourist businesses by 25% reduced in 2007 compared to 2022 [2, 15].

Since this is a small study conducted in villages located in the border areas of Thailand and Myanmar, the findings could not completely generalize to other populations. The study should also cover the whole year cycle to see the impact in the whole five (5) dimensions. Extending the study to people who are living in Myanmar could help in understanding the context completely.

Conclusion

Farming and other outdoor burnings are major sources of poor air quality or air pollution in the border areas of Thailand and Myanmar. Several health impacts are identified from the air pollution including poor quality of life to those who have underlying diseases including stress and anxiety and lack of family income during the pollution presented. Collaborations between organizations at local, national, and international levels are urgently required to address this great problem in the areas.

Competing interests

The authors had no competing interests to declare.

Acknowledgements

We would like to thank all participants. We also express our gratitude to the advisers and professors at Mae Fah Luang University, Mae Sai Hospital, Pha Mhee Primary Health Care, and Wiang Pang Kham Sub-district for supporting the study.

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