

## Introduction

Air pollution problem has become serious environmental and health issues in the north of Thailand. This condition leads to crucial airway and lung diseases particularly asthma and chronic obstructive pulmonary disease (COPD). Pulmonary function data of people living in that area has been limited. This study aimed to determine pulmonary functions and prevalence of airway diseases among rural residents in high air pollution area in northern Thailand.

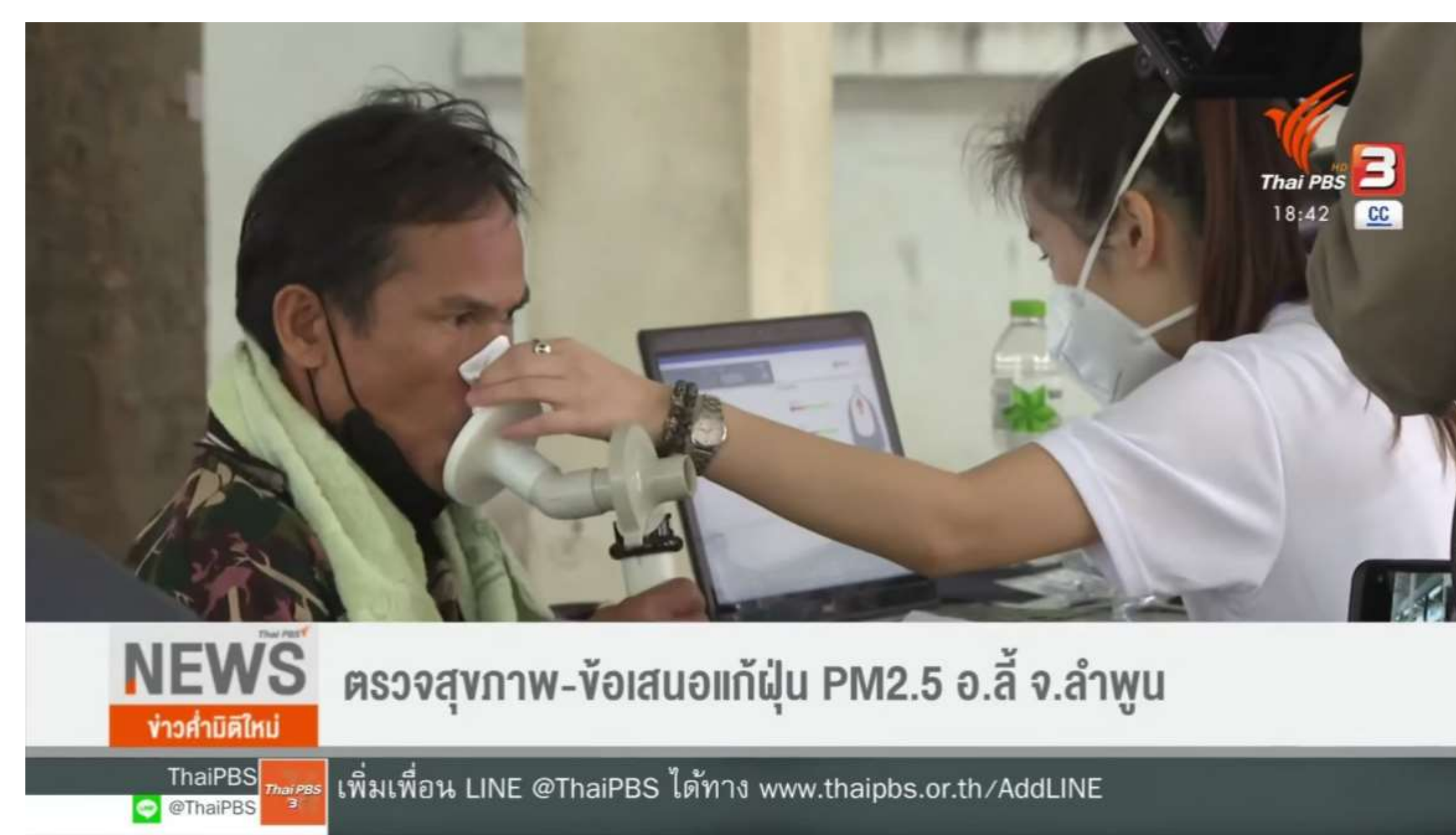
## Methods

A cross-sectional study was conducted in people aged 18 years or older, living in Lamphun, northern Thailand on December 2021. Demographics, pre-existing diseases, respiratory symptoms, and pulmonary functions by spirometry including forced vital capacity (FVC), forced expiratory volume in one second (FEV<sub>1</sub>), peak expiration flow (PEF), forced expiration flow rate at 25-75% of FVC (FEF<sub>25-75</sub>), and bronchodilator reversibility (BDR) were collected. Abnormal lung functions were defined as airway obstruction (FEV<sub>1</sub>/FVC<70%) or restrictive lung disease (FVC<80%) or small airway disease (FEF<sub>25-75</sub><65%) or BDR (FEV<sub>1</sub> change after BD test >12% and 200 mL).

**Table 1. Baseline characteristics**

Characteristics	Data (n=127)
Age, years	43.76±11.32
Male	100 (78.7)
Smoking (current or former)	66 (52.0)
Amount of smoking, pack-years	4.44±5.45
<b>Occupations</b>	
Government officer	58 (45.7)
Farmer	41 (32.3)
General employee	16 (12.6)
Others	9 (7.0)
Unemployment	3 (2.4)
<b>Outdoor job</b>	86 (67.7)
<b>Biomass fuel use for cooking</b>	65 (51.2)
<b>Mask wearing for smog protection</b>	90 (70.9)
<b>Self-reported respiratory diseases</b>	
Allergic rhinitis	9 (7.1)
Asthma	1 (0.8)
COPD	1 (0.8)
<b>Respiratory symptoms</b>	42 (33.1)
Runny nose	18 (14.2)
Nasal obstruction	13 (10.2)
Cough	12 (9.4)
Sputum production,	10 (7.9)
Breathlessness	8 (6.3)
Chest tightness	4 (3.1)
Sore throat	4 (3.1)
Wheezes	2 (1.6)

Data shown as N (%), mean ± SD  
COPD=chronic obstructive pulmonary disease



## Results

A total of 127 people (78.7% male) were included. Mean age was 43.76±11.32 years. Current or former smoking was 52.0% and 4.44±5.45 pack-years. The most common occupation was government officer (45.7%). Biomass fuel use for cooking was 51.2%. Allergic rhinitis (7.1%) was the most common self-reported respiratory disease. Runny nose (14.2%) was the most common presenting respiratory symptom.

**Abnormal lung functions** were found in **12.6%**. Airway obstruction was 2.4%. Restrictive lung disease was 7.1%. **Small airway disease** was **11.0%**. There was no BDR. Compared to people with normal lung functions, abnormal lung function group had higher proportion of breathlessness (18.8% Vs 4.5%, P=0.062).

**Table 2. Lung function data**

Parameters	Data (n=127)
FVC, L	3.56±0.75
FVC, %	96.74±12.9
FEV <sub>1</sub> , L	2.97±0.65
FEV <sub>1</sub> , %	97.52±12.99
FEV <sub>1</sub> change after BD test, %	1.92±4.13
FEV <sub>1</sub> /FVC, %	83.67±5.81
PEF, L/s	8.10±1.85
PEF, %	102.46±19.18
FEF <sub>25-75</sub> , L/s	3.28±1.17
FEF <sub>25-75</sub> , %	96.77±29.88
FVC <80%	9 (7.1)
FEV <sub>1</sub> /FVC <70%	3 (2.4)
FEF <sub>25-75</sub> <65%	14 (11.0)
FEV <sub>1</sub> change after BD test >12% and 200 mL	0 (0)

Data shown as N (%), mean ± SD  
BD=bronchodilator, FEV<sub>1</sub>=forced expiratory volume in 1 second, FVC=forced vital capacity, FEF<sub>25-75</sub>=forced expiratory flow at 25-75% of FVC, PEF=peak expiratory flow, L=liters, mL=milliliters, s=second

## Conclusions

Abnormal pulmonary functions, especially small airway disease, were relative common in rural residents in air pollution area in northern Thailand. These had trend to present with more symptoms. Large prospective studies are needed to investigate lung functions and long-term clinical outcomes in respiratory diseases in this area.

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