

CHAPTER I

INTRODUCTION



1.1 Statement of Problem

Epidemiological studies found relatively consistent associations between outdoor particulate matter concentrations and various adverse health effects such as exacerbation of asthma, other respiratory tract diseases (Ware *et al.*, 1984; Dockery *et al.*, 1989; Timonen *et al.*, 1995; Braun *et al.*, 1997; and Boezen *et al.*, 1999;), and decrements in lung function (Collier *et al.*, 1978; Schwartz *et al.*, 1989; Hoek *et al.*, 1998; Jedrychowski *et al.*, 1999; Gauderman *et al.*, 2000; Horak *et al.*, 2002; and Gauderman *et al.*, 2004).

The high concentration of respirable particulate matter (PM₁₀) in ambient air is one of the serious environmental problems in Bangkok city, particularly in the traffic-congested areas. PM₁₀ levels have been monitored systematically at 38 Pollution Control Department (PCD) monitoring stations. There were many areas that annual average PM₁₀ concentrations were found higher than the National Ambient Air Quality Standard (NAAQS). In 2004, the annual average concentrations of total suspended particulate matter (TSP) and PM₁₀ at roadside monitoring stations were about 0.18 mg/m³ and 78.50 µg/m³, exceeding the standard (PCD, 2005) by approximately 8.3 and 8.4% days, respectively. There is potential increase of pollutants concentrations each year. Furthermore, PM₁₀ in Bangkok has been associated with serious health effects, such as increased hospital admissions and mortality (Ostro *et al.*, 1999). The health associations between air pollution and respiratory symptoms among traffic policemen (Wongsurakiat *et al.*, 1999; Karita *et al.*, 2001; Jinsart *et al.*, 2002; and Tamura *et al.*, 2003) and their wives (Karita *et al.*, 2004) were reported. However, those studies have mainly been conducted in healthy adults groups. It is not clear to what extent such associations would be revealed in children who might be more susceptible to air pollution than adults. A few researches

were reported the increasing of respiratory symptoms (Aekplakorn *et al.*, 2003a) and impaired lung function among asthmatic children near Maemoh power plant, Thailand (Aekplakorn *et al.*, 2003b). However, the chronic health effects for children remain uncertain, particularly for Bangkok children. Therefore, with a cross-sectional design, the possible chronic effects of exposure to air pollution in Bangkok schoolchildren were investigated. This study was aimed to evaluate the association between air pollution and respiratory symptoms, or lung function, using the ATS-DLD-78-C respiratory questionnaires and the spirometry tests among schoolchildren in different air pollution levels.

1.2 Objectives

The main objective of this work is to study chronic health effects of fine particulate matter less than 10 μm in diameter on respiratory symptoms and lung function in Bangkok schoolchildren.

This can be divided into five sub-objectives:

1. To find the prevalence of respiratory symptoms and impaired lung function in children age 10-15 years living in Bangkok.
2. To determine the association between exposure to PM_{10} and the prevalence of respiratory symptoms in Bangkok children.
3. To determine the association between exposure to PM_{10} and impaired lung function in Bangkok children.
4. To study the association between other risk factors, prevalence of respiratory symptoms and impaired lung function in Bangkok children.
5. To determine the relationship between air pollution, prevalence of respiratory symptoms and impaired lung function of children living in the mega city of Bangkok Metropolis and the rural town of Phra Nakhon Si Ayutthaya.

1.3 Scopes of the Study

1. Study sites in Bangkok and Ayutthaya province are schools located close to, or within 2 km from PCD roadside and general ambient air quality

monitoring station (Din Daeng Housing Authority, Nonsi Withaya School, Thonburi Substation, Khlong Chan Housing Community, and Ayutthaya Witthayalai School Station).

2. The prevalence of respiratory symptoms was assessed by modified Thai version of the ATS-DLD-78-C respiratory questionnaires.
3. Lung function was measured by spirometry.
4. Chronic health effects will be determined in schoolchildren, age 10-15 years in 2004.
5. Variables:
 - Dependent variables: Respiratory symptoms, impaired lung function.
 - Independent variables: Questionnaire responder, gender, age, residential years, home size, family members, parental smoking habits, use of air conditioner, having domestic pets, and residential location areas.
 - Control variable: Smoking index.
 - Confounding factor: Socioeconomic status.

1.4 Benefits of the study

The prevalence of respiratory symptoms and impaired lung function in schoolchildren in different areas was assessed. Association between exposure to PM₁₀, the prevalence of respiratory symptoms and impaired lung function was evaluated. Furthermore, the other risk factors, which may be effects on human health such as questionnaire responder, gender, age, residential years, home size, family members, parental smoking habits, use of air conditioner, and having domestic pets were analyzed in this study.

It can lead to contributing scientific information in risk assessment especially about relationships between particulate matter and public health. In addition, it is useful for decision makers in setting priorities between many competing environmental and public health issues.