Association Between PM_{10} and O_3 Levels and Hospital Visits for Cardiovascular Diseases in Bangkok, Thailand

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ABSTRACT

Background: The association between air pollution and cardiovascular diseases is well known, but previous studies only assessed mortality and hospital admissions in North America, Europe, and Northeast Asia. Few studies have been conducted in less-developed countries in regions with a tropical climate. This study evaluated whether short-term exposures to fine particulate matter (PM10) and ozone (O3) were associated with hospital visits for cardiovascular diseases (CVD; ICD-10th, I00–I99) in central Bangkok, Thailand.

Methods: Data from hospital records were obtained from 3 major government hospitals. All hospital visits were stratified by age group and category of CVD. Daily PM10 and O3 levels reported by the Pollution Control Department from April 2002 to December 2006 (1736 days) were used in a time-series analysis with a generalized additive model procedure.

Results: Exposure on the previous day to PM10 and O3 had a positive association with hospital visits for CVD among elderly (≥65 years) individuals. The increase in CVD hospital visits in this age group was 0.10% (95% CI, 0.03–0.19) with a 10 μg/m3 increase in PM10, and 0.50% (95% CI, 0.19–0.81) with an increase in O3.

Conclusions: In central Bangkok, a short-term association was observed between increases in daily levels of PM10 and O3 and the number of daily emergency hospital visits for CVD, particularly among individuals aged ≥65 years.

Key words: PM10; ozone; cardiovascular diseases; hospital visits; Bangkok; air pollution

INTRODUCTION 2006 the daily average PM10 and O3 concentrations in some areas were higher than the National Ambient Air Quality
Standard. There have been many reports implicating PM10 andIn recent decades, epidemiologic studies conducted worldwide
have shown that short-and long-term exposure to air O3 as risk factors for heart disease.4–7 Kodavanti et al8 found
an association between combustion particles and both reduced pollutants, especially particulate

matter, is associated with a
risk for respiratory and cardiovascular heart rate variability (HRV) and increased fibrinogen levels in consistently higher
events, including heart attacks and stroke deaths.1–7 The rats. These relations have been confirmed in several human
studies, which have shown that airborne particles areangkok metropolitan area has a very high population density
associated with increased plasma viscosity,9–11 decreased (4051 persons per km2) and 6.12 million registered motor
HRV,12–14 and the onset of myocardial infarction.7,9 Ozone, vehicles. Problems related to traffic-related air pollution in
an oxidant gas, can cause respiratory tract damage that may angkok are becoming more frequent because of the limited
induce pulmonary inflammation and edema10,15; it has also number of transport routes and the rapidly increasing number
been found to have a direct bradycardiac effect in animal of vehicles on the roads. High concentrations of particulate
matter with a diameter of less than 10 μm (PM10) from studies.16 Similar to PM10, exposure to O3 in humans has been
a secondary pollutant, ozone (O3), associated with a decrease in HRV13 and an increase in the automobile exhaust and
may cause health problems. Bangkok air quality has been risk of hospitalization for heart disease.17
monitored by 32 Pollution Control Department (PCD) Cardiovascular disease (CVD) is the most common cause
monitoring stations for several years. Between 2004 and of morbidity and mortality in the developed world.

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