

行政院國家科學委員會專題研究計畫 成果報告

子計劃：空氣品質改善對民眾呼吸系統健康之效益評估

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中文摘要

流行病學研究的結果顯示空氣污染物NO₂、CO、O₃、SO₂、PM₁₀的暴露可能會增加呼吸道疾病的急診、住院、或死亡等。但是國內的空氣污染物是否可能在不同年齡層的國人引起這些健康效應，尚未被釐清，亟待全面而深入地探討。本計畫希望透過空氣污染物與國人呼吸系統健康關係之研究，瞭解CO、NO₂與SO₂濃度下降對國人健康效益之影響，以及O₃及PM₁₀濃度變化對國人呼吸系統健康之衝擊。本研究之目的乃探討空氣污染物PM₁₀、O₃、CO、NO₂、SO₂之暴露與七大空品區居民的呼吸道疾病急診、住院及死亡之關係。配合子計畫一完成七大空品區居民之空氣污染物暴露評估，彙整1996年至2001年的全民健康保險門診與住院資料、衛生署1994年至2002年的死因資料檔、內政部人口統計資料，完成七大空品區各年齡層居民的呼吸道疾病急診、住院、及呼吸道疾病死亡之描述性流行病學分析，並且使用時間序列統計分析方式，評估PM₁₀、O₃、CO、NO₂、SO₂之暴露與七大空品區各年齡層居民的呼吸道疾病每日急診、住院、及死亡之關係。本研究之主要成果如下：(一)、1996年至2001年間七大空品區居民的每日呼吸道疾病住院數之描述性分析；(二)、1994年至2002年間七大空品區居民的每日呼吸道疾病死亡數、每日總死亡數之描述性分析，七大空品區居民的每年呼吸道疾病死亡率與總死亡率之描述性分析；(三)、七大空品區居民每日呼吸道疾病急診數之描述性分析；(四)當日各空氣污染物濃度與每日呼吸道疾病死亡數、住院數、急診數之相關係數分別介於-0.16~0.09、-0.12~0.22、-0.33~0.13之間；在不同空品區，同一個空氣污染物以不同的時間點的濃度與每日呼吸道疾病死亡數或住院數的相關係數最大；(五)、以Poison regression分析，並且控制年、星期、溫度、濕度後，北部、雲嘉南、高屏空品區≥65歲居民每日所有呼吸道疾病死亡數與五個空污物有顯著正相關(相對危險比 relative risk, RR>1.00, p<0.001)；七個空品區居民每日所有呼吸道疾病急診數與四或五個空污物有顯著正相關；北部、竹苗、中部、雲嘉南、宜蘭空品區居民每日所有呼吸道疾病住院數與四或五個空污物有顯著正相關。本研究之結論有四：(一)、各空品區的呼吸道疾病年齡標準化死亡率在1994至2002年間上揚後漸減又呈現上揚趨勢，與各空氣污染物年平均值的趨勢未呈現一致的變化；(二)、北部、雲嘉南、高屏空品區≥65歲居民每日所有呼吸道疾病死亡數與五個空污物有顯著正相關(RR>1.00)；(三)、北部、竹苗、中部、雲嘉南、宜蘭空品區居民每日所有呼吸道疾病住院數與四或五個空污物有顯著正相關(RR>1.00)；(四)、七個空品區居民每日所有呼吸道疾病急診數與四或五個空污物有顯著正相關(RR>1.00)。本研究之主要研究限制：以空品區為單位，個別區內的空污濃度之差異可能無法以該區的平均值估計；以空品區內醫療院所的呼吸道疾病急診、住院人數為健康效應，而病人可能來自其他空品區，可能對暴露 - 健康效應關係的評估造成偏差。因此本研究之結果有待進一步以較小區域做探討。

關鍵字：空氣污染、臭氧、懸浮微粒、呼吸道疾病、住院、死亡、流行病學

英文摘要

Previous epidemiological studies have reported significant associations between air pollutants, including NO₂, CO, O₃, SO₂, PM₁₀, and increased daily emergency room visits or hospital admissions due to respiratory disease or daily mortality from respiratory causes. The relationships between these potential health effects and air pollution in Taiwan population are not well understood and merit further investigation. The purpose of this study was to investigate the association between NO₂, CO, O₃, SO₂, PM₁₀ exposure, respectively, and respiratory disease emergency room visits, hospital admissions, and daily mortality among population of the seven major air quality districts in Taiwan. We collaborated with sub-project 1 in assessing the exposures to air pollutants, NO₂, CO, O₃, SO₂, PM₁₀, for population of the seven major air quality districts. The data regarding respiratory disease emergency room visits and admissions during 1996 and 2001 were collected from National Health Insurance Research Database, and respiratory mortality during 1994-2001 from the mortality database of the Department of Health. Data analysis included descriptive statistics of health outcomes, comparisons of outcomes among population of seven districts and among years, and generalized additive model and Poisson regression analysis for assessing the association between each air pollutant and each of the health outcomes. Major results from the first-year study are described as follows. First, we had the descriptive statistics for daily count of respiratory disease death, hospital admissions, and emergency room visits of residents (0-14, 15-64, 65+ y/o) in seven districts. Second, the correlation coefficients ranged from -0.16 to 0.09, -0.12 to 0.22, and -0.33 to 0.13, respectively, for daily concentration of each air pollutant and daily respiratory death, hospital admissions, and emergency room visits. When considering time lag and moving average, the correlation coefficients differed for air pollutants and for seven districts. Results of the Poisson regression analysis, with adjustment for calendar year, weekday, temperature, and dew point, showed that (1) daily respiratory disease death count was significantly associated with all five air pollutants for people aged 65+ years in the North, Yun-Gia-Nan, and Kao-Pin districts (relative risk, RR > 1.00, p<0.001); (2) daily count of respiratory disease hospital admissions was significantly associated with four or five of the air pollutants for people of the North, Ju-Miao, Central, Yun-Gia-Nan, and YiLan districts (RR > 1.00, p<0.001); (3) daily count of emergency room visit for respiratory diseases was significantly associated with four or five air pollutants in all seven districts (RR > 1.00, p <0.001). This study had two major limitations. First, air quality district was used as the study unit and the results might be biased by misclassification of exposures. Second, daily counts of the hospital admissions and emergency room visits were calculated for hospitals in respective district, whereas patients might have come from other districts. The exposure-disease association could be biased. Further studies are suggested to assess the effects of air pollution on respiratory health of residents living near air monitoring stations.

Key words: air pollution; ozone; particulate matter; respiratory diseases; hospital admissions; mortality; epidemiology