

The Impact of Air Pollution on Public Health

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Introduction

Since 1980's, air pollution level in Malaysia was maintained well below the Malaysian Air Quality Guidelines (MAQG, 1989). However, slight increases were observed during series of haze episodes in 1983, 1984, 1990, 1991, 1994 and recently, through September 1997¹⁻⁷. The increase of gaseous pollutants during those times was of insignificant value, but the PM10 concentration sharply elevated. Researchers elsewhere have provided ample evidence associating changes in pollution level with adverse health effects, particularly the respiratory system. Since PM10 was the only pollutant that showed alarming increases during haze, we strongly believe that it was the major problem. Despite the frequent cases of haze, and the worsening air quality especially in the Klang Valley, only a few groups focus on the health impacts it might bring to the public. This project was undertaken to i) identify diseases associated with or aggravated by haze, ii) correlate the incidence of haze and the health status of the public, and, iii) evaluate the respiratory functions of individuals exposed to haze/ambient air pollution.

Materials and Methods

Daily air quality data (Alam Sekitar Malaysia, ASMA) and hospital admission and outpatient data (from all main hospitals in Malaysia), especially during the period of haze were analyzed to identify diseases associated with or aggravated by haze. The correlation between the pollutant levels and the hospital records was determined (objective i and ii). To achieve objective iii, school children in areas with significantly different air quality levels were chosen as the study subjects, one area with the lowest pollutant level serve as reference. The subjects have to fill up a set of questionnaire and per-

form spirometry tests using a spirometer (Vitalograph Ltd.) and spiroanalyzer (Fukuda-Sangyo). The data are analyzed using SPSS 8.0 for Windows.

Results and Discussion

From the hospital data (Selangor only), we identified ARI, asthma and conjunctivitis as the diseases closely associated and aggravated by the haze. Taking June as a reference month (period before haze), tremendous increase in the number of these diseases was observed during September, especially in adults. Total ARI cases increased from 6054 to 34383 (5.7 fold, June to September 1997) and asthma 912 to 5437(6 fold). Conjunctivitis cases were also sharply elevated (207 to 3173, 13.7 fold). Even though the increase was significant, there is no statistically significant correlation between the monthly number of cases and the average air quality data ($p < 0.05$). This contradicts our hypothesis that suggests a strong correlation between PM10 and those diseases. More effort should be done to gather enough information to determine the exact relationship between these two parameters. So far, the data provided by the hospitals was pooled from nine districts in Selangor (not area-specific), and the air quality was averaged from five ASMA stations, which showed significantly different measurements (Anova, $p < 0.05$). However, the health data for Sarawak (Sept. 97) showed a significant relationship with the API readings (correlation $p < 0.01$). The decreased number of cases in parallel to the reduction in PM10 level back to normal values after September observed in Selangor suggests that the effects are reversible.

Studies on schoolchildren exposed to significantly different levels of ambient PM10 ($103.27\mu\text{g}/\text{m}^3$ vs. $47.35\mu\text{g}/\text{m}^3$) revealed that higher exposure leads to lower respiratory functions (VC, FVC, FEVI etc.). From the completed ques-

tionnaire, those in areas of higher exposure reported higher incidence of respiratory symptoms, including runny nose, sore throat, cough and chest tightness. In response to one of the questions, only 41% of the schoolchildren who reported suffering illness or discomfort during the period of haze went for medical treatment.

Conclusions

From the health and air quality data, supported by the significant positive correlation showed by the data for Sarawak, we strongly believe that high PM10 is detrimental to public health. However, the effects might be reversible. The study on schoolchildren proved that long-term exposure to high PM10 level (even though below the MAQG, $150\mu\text{g}/\text{m}^3$) could reduce the lung function.

Benefits from the study

Information from this project is essential for establishment of evidence of health hazards related to haze, and possibly formulation or revision of national guidelines on air pollution.

Other benefits from the study included; National awareness of potential health hazards due to haze; Improvements in the environment as the results of awareness and positive response of the society in general; and Improvement in health (healthier environment).

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