

Risks of Trace Gaseous on Cardiovascular and Respiratory Hospitalisations in Kuala Lumpur, Malaysia

Muhammad Abdul Basit Ahmad Tajudin¹, Md Firoz Khan², Wan Rozita Wan Mahiyuddin³, Rozita Hod⁴, Saperi Sulong⁴, Mohd Talib Latif⁵, Mazrura Sahani^{1*}

¹Environmental Health and Industrial Safety Program, School of Diagnostic Science and Applied Health, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur, Malaysia

²Centre for Tropical Climate Change System, Institute of Climate Change, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia ³Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, Malaysia ⁴Hospital Canselor Tuanku Muhriz, UKM, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Kuala Lumpur Malaysia

⁵School of Environmental and Natural Resource Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

*Corresponding author

E-mail: mazrura@ukm.edu.my

Many cities are currently burdened and confronted by multiple threats. Rapid urbanisations in Malaysia poses risks to the health of its residence. This study was conducted to estimate the relative risk (RR) of trace gaseous on cardiovascular and respiratory hospitalisations in Kuala Lumpur. Daily hospitalisations of cardiovascular and respiratory diseases from 2010-2014 were obtained from Hospital Canselor Tuanku Muhris (HCTM). Concentration of trace gaseous such as sulphur dioxide (SO₂) nitrogen dioxide (NO₂), carbon monoxide (CO) and ozone (O₃) as well as meteorological parameters (temperature, relative humidity, wind speed and wind direction) were obtained from the Department of Environment (DOE) Malaysia for the same study period. Generalised Additive Model (GAM) model based on Poisson regression was applied to this study. The results revealed that all trace gases showed significant effects towards cardiovascular and respiratory hospitalisations. Immediate effects on cardiovascular hospitalisations were observed for NO₂ and O₃ but no immediate effect were found on respiratory hospitalisation. Delayed effects on cardiovascular and respiratory hospitalisations were found with SO₂ and NO₂. The highest RR value was observed at lag 4 for respiratory admissions with SO₂ (RR = 1.123, 95% CI = 1.045-1.207), followed by NO₂ at lag 5 for cardiovascular admissions (RR = 1.025, 95% CI = 1.005-1.046). For multi-pollutant model, NO₂ lag 5 has been found to have the highest risks towards cardiovascular hospitalisation after controlling for O₃ 8h mean lag 1 (RR = 1.026, 95% CI = 1.006-1.047) while SO₂ at lag 4 has been found to have the highest risks towards respiratory hospitalisation after controlling for NO₂ lag 3 (RR = 1.132, 95% CI = 1.053-1.216). Urban air pollution showed both immediate and delayed effects for cardiovascular and respiratory hospitalisations in HCTM from exposure to criteria pollutants.

Keywords: Urban air pollution, trace gaseous, cardiovascular diseases, respiratory diseases, relative risks