中文題目：二氧化硫與粗/細懸浮微粒共同作用對於阻塞性肺病的影響

英文題目： The impact of the synergistic effect of SO_2 and PM_{10}/$PM_{2.5}$ on obstructive lung disease in subtropical Taiwan

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Background: Obstructive lung diseases such as asthma, chronic obstructive pulmonary disease, and bronchiectasis are complex heterogeneous diseases resulting from interactions between environment, lifestyle, and genotype. Ambient air pollution has been identified as a potential risk factor for obstructive lung diseases. In 2016, ambient air pollution caused 4.2 million deaths worldwide, 25% of COPD deaths, and 26% of respiratory infection deaths. In this current study, we aimed to evaluate the relationship between chronic lung diseases, air pollution and meteorological factors.

Methods: Data for this cross-sectional study were obtained from the Taiwan Biobank (TWB) and Taiwan Air Quality Monitoring Database (TAQMD), a total of 8 air pollutants were included in this analysis. We defined obstructive lung diseases as FEV1/FVC < 70%. The average concentrations of air pollutants were obtained from the nearest air quality monitoring station. Descriptive analysis between spirometry groups were performed using one-way ANOVA and Chi-square/Fisher's exact tests. A Generalized Additive Model (GAM) was used to further calculate the relationship between Sulfur dioxide (SO2) and fine particulate matter ($PM_{2.5}$)/coarse particulate matter (PM_{10}) to fit equations and splines. Both crude and adjusted odds ratios (OR) and 95% confidence intervals (CIs) were estimated.

Results: The mean age of the 2635 enrolled participants was 49.80±10.53 years. Of these participants, 1225 (46.5%) were men, and 1410 (53.5%) were women. Regarding environmental factors, higher temperature, higher relative humidity, and lower rainfall were the risk factors for obstructive lung diseases. Model 1 shows the independent predictive factors were temperature (OR 1.24; 95% CI 1.09-1.41; p =0.0009), relative humidity (OR 1.05; 95% CI 1.01-1.10; p =0.0160), rainfall (OR 0.08; 95% CI 0.01-0.68; p =0.0202), PM_{10} (OR 0.99; 95% CI 0.98-0.99; p <0.001), SO_2 (OR 1.25; 95%

CI 1.14-1.36; p <0.001). Model 2 shows the independent predictive factors were temperature (OR 1.31; 95% CI 1.15-1.49; p <0.001), relative humidity (OR 1.04; 95% CI 1.00-1.09; p =0.0372), rainfall (OR 0.08; 95% CI 0.01-0.67; p =0.0197), $PM_{2.5}$ (OR 0.97; 95% CI 0.96-0.98; p <0.001), SO_2 (OR 1.28; 95% CI 1.17-1.39; p <0.001). GAM shows that obstructive impairment was associated with a quadratic pattern for SO_2 (Per SD) and PM_{10} (Per SD) in Model 1 and a quadratic pattern for SO_2 (Per SD) but not $PM_{2.5}$ (Per SD) in Model 2. However, we found that the bivariate (SO_2 vs PM_{10}, SO_2 vs $PM_{2.5}$) thin-plate smoothing spline in models 1 and 2 were significant association with obstructive impairment (p<0.0001), which confirms the synergistic effects among temperature, SO_2 and $PM_{2.5}$, and PM_{10}.

Conclusions: We found that factors associated with higher risk of obstructive lung diseases include higher temperature, higher relative humidity, and lower rainfall. Our research also revealed the interactions and synergistic effects among temperature, SO_2 and $PM_{2.5}$, and PM_{10}. We suggest that the synergistic effects of air pollutants should be considered to reveal the actual impact on obstructive lung diseases.