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Numerical Analysis of Conventional Air Pollutants and PM_{10} Concentration Affected to Respiratory Disease Patients in Bangkok, Thailand

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Abstract. Ambient air pollution is a major cause of death and disease globally. The linear regression between respiratory disease patients, PM_{10} and other criteria pollutants were used in this study. Among respiratory disease patients and CO was statistically significant with P-value of <0.01 (r=0.198, 95% CI=48.74 - 288.16). As for respiratory disease patients and NO_x was statistically significant with P-value of <0.01 (r=0.190, 95% CI=1379.74 – 9241.43).

Keywords. Air pollutants, PM10, Respiratory disease

1. Introduction

Air pollution kills an estimated 7 million people worldwide every year. Air pollution resulting from traffic is a major problem in many cities in Asia, including Bangkok, Thailand. This pollution originates mainly from incomplete fossil fuel combustion, transportation, and construction (Ruchirawat et al, 2007). The concept of this study is utilizing the data obtained from the current conventional air monitoring station in Bangkok to analyze conventional air pollutants and PM_{10} concentrations affected respiratory disease patients in this area.

2. Data analysis and Method

2.1. Data collection and Analysis

The air monitoring data used in this study were from Jan 2013 to Dec 2018. Conventional air pollutants and PM_{10} were monitored at 3 monitoring sites in The Bangkok Metropolitan area. The data of respiratory disease patients in this study from Jan 2013 to Dec 2018. The respiratory disease was bronchitis, emphysema, chronic obstructive pulmonary disease, and asthma. This study was collected from 3 hospitals. The correlation coefficient and linear regression analysis were used to determine a potential correlation between conventional air pollutants and PM_{10} concentrations and number of respiratory diseases patients. Independent variables were conventional air pollutants and PM_{10} concentrations. The dependent variable was respiratory disease patients.

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3. Results and Discussions

3.1. Diurnal variation of PM_{10} concentration and respiratory disease patients

The concentration of PM_{10} shows a similar type of variation as a decrease from May to Sep an increase from Oct to Dec and Jan to Apr of each year. This is probably because of the enhance emission from traffic and seasonal variation (Aurangojeb M., 2011). The number of respiratory disease patient's tendencies increase from Jan 2013 to Dec 2018. The number of respiratory disease patient's tendency decrease from Jan 2013 to Apr 2017 after that increase to Dec 2018. The concentration of PM_{10} shows a similar type of variation as a decrease from May to Sep an increase from Oct to Dec and Jan to Apr of each year. The number of respiratory disease patients slightly varies from Jan 2013 to Dec 2018. After the government of Thailand has taken various roles to mobilize its resources for haze management in the second stage from 2011 to 2019.

3.2. The correlation coefficient and linear regression analysis

The Pearson's product moment correlation coefficient (r) was used to determine the strength of association between a pair of variables, to test the relationship between these variables and to test whether the association is greater than could be expected by chance (Rummasak T., 2019). Among respiratory disease patients and CO was statistically significant with P-value of <0.01 (r=0.198, 95% CI=48.74 - 288.16). As for respiratory disease patients and NOx was statistically significant with P-value of <0.01 (r=0.190, 95% CI=1379.74 – 9241.43) presented in Table 1.

Table 1. Linear regression analysis of respiratory disease patients, PM_{10} and other criteria pollutants

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
2	(Constant)	366.33	110.14		3.326	.001	149.22	583.45
CO		168.45	60.73	.198	2.774	.006	48.74	288.16
NO_x		5310.59	1994.17	.190	2.663	.008	1379.74	9241.43

4. Conclusions

The concentration of PM_{10} shows a decrease from May to Sep an increase from Oct to Dec and Jan to Apr of each year. The number of respiratory disease patient's tendency decrease from Jan 2013 to Apr 2017 after that increase to Dec 2018. The linear regression between respiratory disease patients, PM_{10} and other criteria pollutants were used in this study. Among respiratory disease patients and CO, respiratory disease patients and NO_x were statistically significant.

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