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Submission date: 01-Jul-2021 09:59AM (UTC+0700)

Submission ID: 1614408796

File name: ION_OF_CLIMATE_TO_PARTICULATE_MATTER_IN_PALEMBANG,_INDONESIA.pdf (1.13M)

Word count: 4400

Character count: 23436

ISSN 0257-8050

POLLUTION RESEARCH

EM INTERNATIONAL

VOL. 37 (2) : 2018

POLLUTION RESEARCH

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The views expressed in various articles are those of the authors and not of EM International or the Editors of the Journal

Printed at Cambridge Printing Works, New Delhi-110 028. Phone : 9811860113

CORRELATION OF CLIMATE TO PARTICULATE MATTER IN PALEMBANG

MARSIDI*^{1,2}, M.T. KAMALUDDIN³, FAUZIAH N. KURDI⁴ AND NOVRIKASARI⁵

¹Environmental Science Department, Postgraduate program of Sriwijaya University, Palembang, Indonesia

²Public Health Department, Postgraduate Program of Bina Husada College of Health Sciences,
Palembang, Indonesia

³Faculty of Medicine, Sriwijaya University, Palembang, Indonesia

⁴Faculty of Education, Sriwijaya University, Palembang, Indonesia

⁵Faculty of Public Health, Sriwijaya University, Palembang, Indonesia

(Received 6 February, 2017; accepted 23 March, 2018)

ABSTRACTS

Climate affects the concentration of ambient particles through particulates which affects the human health. The study aims to measure and analyze the correlation between climate factors (temperature and relative humidity) with the exposure of particulate pollutants (PM_{2.5} and PM₁₀) in Palembang. In this study, the data was obtained from the direct measurements to 39 Puskesmas (Primary Health Care) in Palembang. The results showed that with the mean for temperature, relative humidity, PM_{2.5}, and PM₁₀ were 32.5(1.98) °C, 67.2(7.13) %, 10.8(5.59) ug.m⁻³, and 19.5(9.37) ug.m⁻³, respectively. There was a correlation between temperature and humidity with PM_{2.5} and PM₁₀ in Palembang.

KEY WORDS : Climate, PM_{2.5}, PM₁₀, Palembang.

INTRODUCTION

The climate can affects the exposure of particulate pollutants (Yao *et al.*, 2007; Giri *et al.*, 2008; Rathla *et al.*, 2015) in which the concentration of ambient particles is determined by the relative humidity and wind velocity (Lin *et al.*, 2013; Csavina *et al.*, 2014) and temperature (Li *et al.*, 2012; Jallad *et al.*, 2013; Li *et al.*, 2015). The particles of pollutant form small solid or liquid particles contained in the air (Brook *et al.*, 2010; WHO, 2016). The ambient particulates have detrimental effects on the human health (Katsouyanni, 2003; Pope III and Dockery, 2009; Brook *et al.*, 2010; Du *et al.*, 2016; Chen *et al.*, 2016; Lin *et al.*, 2016). These small particles pose a risk to the human health because it can be easily inhaled, passing through the throat and entering the lungs (Brook and Rajagopalan, 2010; Brook *et al.*, 2010).

The most dangerous particles are the particles that are classified as the fine particles, having the smaller diameter than 2.5 microns (about 30 times smaller than the diameter of human hair) (WHO, 2016). The microscopic particles are known as PM_{2.5}.

The short-term exposure of PM_{2.5} can make the health problem in which the long-term exposure exacerbates the respiratory problem. In higher concentration, the exposure can generate some health problems such as cough and some disturbances in eyes, nose, throat (WHO, 2016), lung irritation, shortness of breath (Brunekreef *et al.*, 2009), cardiovascular (Freitas *et al.*, 2010; Brook *et al.*, 2010; Du *et al.*, 2016; Stockfelt *et al.*, 2017), and atherosclerosis (Brook and Rajagopalan, 2010; Du *et al.*, 2016). The children, the elderly, and people with the existing respiratory problem including asthma, and respiratory organ problem and liver pose the high risk and sensitive to PM_{2.5}. Long-term PM_{2.5} exposure is positively associated with the increased mortality (Brook *et al.*, 2010; Du *et al.*, 2016).

The current research shows that the short exposure can initiate the heart attack in the risk population and increases the mortality (Brook *et al.*, 2010). The WHO database has compiled the information about the status of PM_{2.5} and PM₁₀ of

*Corresponding author's email: marsidisaid@gmail.com

¹Doctoral Student of Environmental Science

3,000 cities around the world. It is estimated in 2014, one of ten people breathe with the clean air (WHO, 2016).

The particulate emission, aerosol, and its transportation can be predicted to prevent the hazard impact to human health (Chen *et al.*, 2013; Csavina *et al.*, 2014). Pant *et al.* (2016) reported that India was the highest mortality rates related to air pollution exposure. However, a deeper understanding of the level of ambient pollutants is required as a source of information that is particularly important not only in the city but also in the rural areas. All the information can be used to extend the people attention to detail. This purpose becomes the basis of this study to measure and monitor the environmental quality in terms of temperature, relative humidity, and particulate pollutants in Palembang.

MATERIALS AND METHODS

The climatic data (Temperature, and relative humidity) and the particulate data of PM_{2.5} and PM₁₀ were obtained from the direct measurements using mini particle counter DT-96 (CEM, Shenzhen-China) at 39 puskesmas (primary health care) in Palembang. The data were obtained on the fourth week of January 2018. All the data was processed in

the forms of average, standard deviation, max, and min data, and analyzed with the Spearman method.

RESULTS

All the location of Puskesmas was shown in Fig. 1. All the data of particulate and climate measurements were presented in Fig. 2 and Table 1. Furthermore, the correlation test results were shown in Table 2.

Table 1 showed that the ambient of PM_{2.5} had an average value of 10,77 µg.m⁻³ with a standard deviation of 5.59. The minimum and maximum value of PM_{2.5} were 4 µg.m⁻³ and 33 µg.m⁻³ located in the puskesmas of Multi Wahana and Plaju. For the ambient of PM₁₀, the average value was measured as 19.46 µg.m⁻³ with a standard deviation of 9.37. The obtained minimum and maximum value of PM₁₀ were 9 µg.m⁻³ and 44 µg.m⁻³, respectively which

Table 1. Data of PM Ambient and Climate Parameter of Puskesmas in Palembang.

Variables	Mean	SD	Min	Max
PM _{2.5} (ug.m ⁻³)	10.8	5.59	4	33
PM ₁₀ (ug.m ⁻³)	19.5	9.37	9	44
Temperature (°C)	32.5	1.98	27.2	38.0
Relative Humidity (%)	67.2	7.13	50.3	89.5

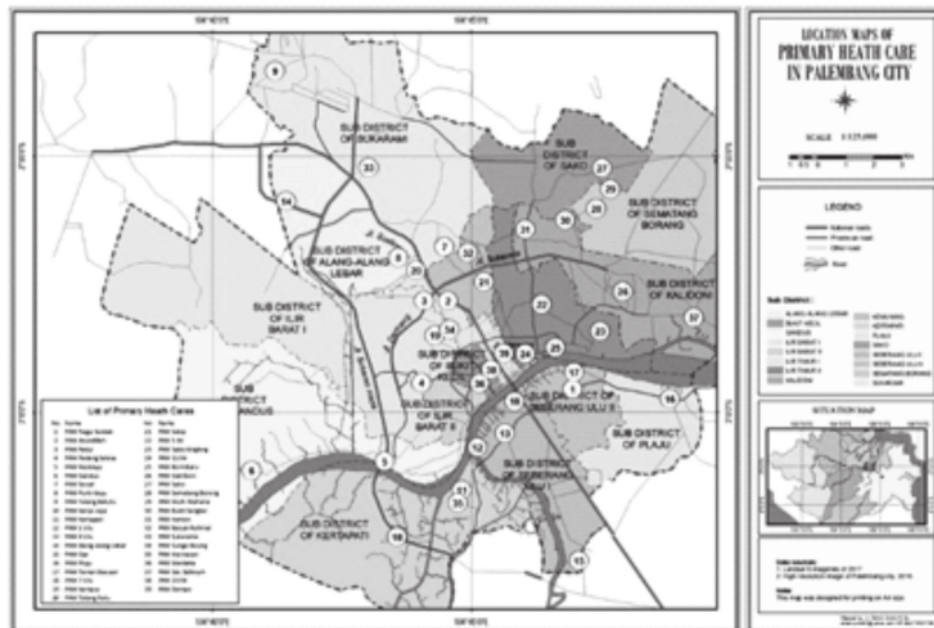


Fig. 1. Map location of Puskesmas in Palembang

located in the puskesmas of Multi Wahana and Boom Baru. According to the threshold value standard of $PM_{2.5}$ and PM_{10} issued by the Meteorology, Climatology, and Geophysics Agency (BMKG). All the puskesmas in the studied area had no exceed the daily threshold value standard.

For the climate measurements, the average temperature in the studied area was obtained in $32.52^{\circ}C$ with a standard deviation of 1.98. The minimum and maximum temperature were detected as $27.2^{\circ}C$ and $38^{\circ}C$, respectively and located in the puskesmas of plaju and alang-alang lebar. Furthermore, the average value of relative humidity in the studied area had 67.17 % with a standard deviation of 7.13. The minimum and maximum value were detected as 50.3% and 89.5%, respectively and located in the puskesmas of Ariodillah and Plaju. According to the BMKG of Palembang, the climate status was in the rainy season (wet season).

Table 2 showed that $PM_{2.5}$ positively significant and correlated to PM_{10} ($r = 0.952$; $p = 0.001$) and the relative humidity ($r = 0.580$; $p = 0.001$) in which showed the negative correlation to temperature ($r = -0.389$; $p = 0.014$). In addition, PM_{10} exhibited the positively significant and correlated to the relative humidity ($r = 0.620$; $p = 0.001$) and negatively correlated to temperature ($r = -0.432$; $p = 0.006$). Furthermore, temperature represented the negative correlation to the relative humidity ($r = -0.623$; $p = 0.001$).

The exposures of $PM_{2.5}$ and PM_{10} were generated from two different sources. $PM_{2.5}$ was obtained from the vehicle exhaust discharges while PM_{10} was generated from the friction of vehicle tires by road. It could be shown that the closer the location of puskesmas with the main road through the vehicle, the higher of particulate detected ($PM_{2.5}$ dan PM_{10}). It was supported by the data of particulate matter which detected in the puskesmas near the main road such as Plaju ($33 \mu g.m^{-3}$; $43 \mu g.m^{-3}$), Boom Baru

($22 \mu g.m^{-3}$; $44 \mu g.m^{-3}$), and Talang Betutu ($22 \mu g.m^{-3}$; $44 \mu g.m^{-3}$). In the other side, the puskesmas that located away from the main road had the small particulate matter such as Multi Wahana ($4 \mu g.m^{-3}$; $9 \mu g.m^{-3}$), Bukit Sangkal ($7 \mu g.m^{-3}$; $12 \mu g.m^{-3}$) and Kalidoni ($7 \mu g.m^{-3}$; $13 \mu g.m^{-3}$).

The particulate exposure ($PM_{2.5}$ dan PM_{10}) were also affected by the weather condition such as temperature and relative humidity. The increasing of temperature generated the decreasing of particulate exposure whereas the increase of relative humidity decreased the particulate exposure.

In the puskesmas plaju, there was a high of particulate exposure in which the $PM_{2.5}$ and PM_{10} showed $33 \mu g.m^{-3}$ and $44 \mu g.m^{-3}$, respectively. The

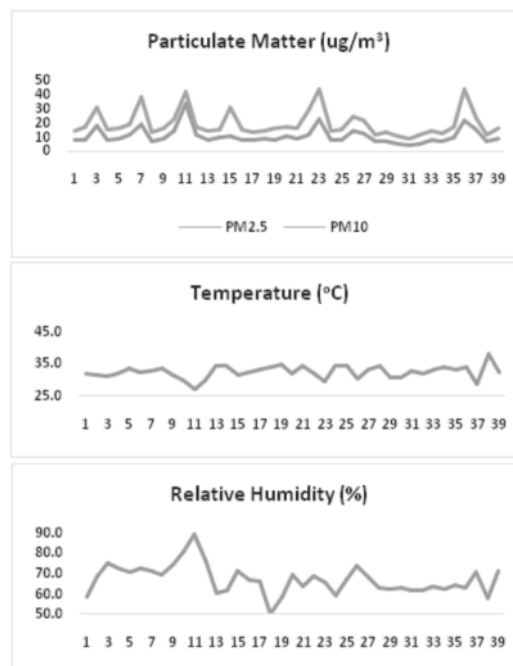


Fig. 2. The measurement results of 39 Puskesmas in Palembang.

Table 2. Results of Correlation test with the Spearman method.

	Variables	PM_{10}	Temp.	R. Humidity
$PM_{2.5}$	Cor. Coefficient	0.952**	-0.389*	0.580**
	Sig. (2 tailed)	0.001	0.014	0.001
PM_{10}	Cor. Coefficient		-0.432**	0.620**
	Sig. (2 tailed)		0.006	0.001
Temp.	Cor. Coefficient			-0.623**
	Sig. (2 tailed)			0.001

* $p < 0.05$; ** $p < 0.01$

high of particulate exposure was supported by the measurement of temperature and the relative humidity in which in Plaju, the temperature was relatively low temperature (27.2 °C) and the relative humidity was quite high (89.5%). Compared to the puskesmas of Plaju, the temperature in the puskesmas Alang-alang Lebar had the higher temperature (38.0 °C) and lower relative humidity (58.1 %) that the PM_{2.5} and PM₁₀ of the puskesmas of Alang-alang lebar had the lower particulate exposure in which the PM_{2.5} and PM₁₀ showed 7 ug.m⁻³ and 11 ug.m⁻³, respectively.

DISCUSSION

According to the threshold value standard of PM_{2.5} and PM₁₀ issued by the Meteorology, Climatology, and Geophysics Agency (BMKG) based on EPA-US, the results of ambient pollutant measurements (PM_{2.5} and PM₁₀) in Palembang had the particulate concentrations below the threshold value. The low concentration of particulate matter was due to the measurement in the rainy season (wet). The results were supported by the study of Owoade *et al.* (2012) reported that the seasonal variations of PM_{2.5} and PM_{2.5-10} would vary in which the high PM concentration occurred in the dry season and the low concentration occurred in the rainy season. Furthermore, Jallad *et al.* (2013) showed that the summer generated the higher PM concentration compared the rainy season.

In general, the developing countries with the large population had increased the concentration of particulate ambient pollutants including Indonesia (WHO, 2016). Chu and Paisie (2006) evaluated the current state of PM_{2.5} in the united states studied over 5 years with the federal data reference methods. The critical design value for each monitoring station was calculated. The higher risk of 24-hour TLV NAAQS in the western United States (California) was affected by annual variability, particularly emissions in nature matters such as forest fires, as these events played a significant role in the rapid emergence of short PM_{2.5} short-term exposure in the west of the United States. Fang *et al.* (2017) assessed the ambient sources of PM_{2.5} and PM₁₀ in Haikou, China and found that the particle concentration was higher in the winter than in spring. The ratio of PM_{2.5} to PM₁₀ was greater than 0.6. Furthermore, it was found that the ambient particulates consisted of dust suspended (17.5 – 35.0%), vehicle exhaust (14.9 – 23.6 %), and the

particle from the secondary source (20.4 – 28.8%). Tai *et al.* (2010) obtained that the mean of the concentration of PM_{2.5} was 2.6 ug.m⁻³ that was higher in the stuck condition than non-jam. The fine particulate composition included sulfate, organic carbon (OC), and elemental carbon (EC). Owoade *et al.* (2012) conducted a study in Nigeria and found that the daily variation of PM with a mean concentration for PM_{2.5} and PM_{2.5-10} were 25.37 ug.m⁻³ and 37.15 ug.m⁻³. Furthermore, the analysis of PM composition with INAA assay was obtained by fourteen elements (As, Br, Cu, K, La, Na, Sb, Sr, Zn, Ce, Co, Cr, Sc and Th) and Br, K, Na, Sr, and Zn became the dominant elements. The PM was generated from local anthropogenic and long-term sources of pollutants.

Kim and Hopke (2006) examined the characterization of the composition of fine particle sources in the great smoky mountains and found that there were 8 composition of the extraction which were summer-high secondary sulfate (55%), carbon-rich secondary sulfate (16%), summer-low secondary sulfate (2%), gasoline vehicle emissions (13%), diesel emissions (1%), airborne soil (6%), industry (5%), and secondary nitrate (2%).

The results showed that there was a negative correlation between temperature to the relative humidity in which the higher temperature would affect lower humidity and vice versa. The results were supported by Yao *et al.* (2007).

There was a negative correlation between the temperature to the particulate matters in which the higher temperatures gave the decreasing of particulate concentration. The result was supported by the work conducted by Yao *et al.* (2007) that reported that the temperature was negatively correlated to particulate (black carbon). Tai *et al.* (2010) obtained the different result. They reported that the temperature was positively correlated with the particulate in sulfate form, organic carbon (OC), and carbon element. In the other hand, Owoade *et al.* (2012) claimed that the temperature was not correlated with the particulate matters.

There was a positive correlation between the relative humidity and the particulate in which the increased relative humidity would increase the particulate concentration. Tai *et al.* (2010) proved that the relative humidity was positively correlated with the particulates in the form of sulfate and nitrate. Yao *et al.* (2007) obtained the different result. The relative humidity was believed showing the negative correlation to the formation of fine

particles of the vehicle with various vehicle particle size distribution in Hong Kong. Similarly, the results of research that were conducted by Jallad *et al.* (2013); Frietas *et al.* (2009), and Csavina *et al.* (2014) proved that the temperature and the relative humidity lead to change the particulate concentration.

CONCLUSION

The exposure of PM_{2.5} and PM₁₀ in Palembang had no exceed the daily threshold value standard arranged by BMKG of Indonesia. The exposures of PM_{2.5} and PM₁₀ in Palembang was negatively correlated with temperature, whereas positively correlated to the relative humidity. In addition, the temperature was negatively correlated with the relative humidity.

REFERENCES

- Brook, R.D. and Rajagopalan, S. 2010. Particulate Matter Air Pollution and Atherosclerosis. *Curr Atheroscler Rep.* 12: 291-300.
- Brook, R.D., Rajagopalan, S., Pope III, C.A., Brook, J.R., Bhatnagar, A., Diez-Roux, A.V., *et al.* 2010. Particulate Matter Air Pollution and Cardiovascular Disease: An Update to the Scientific Statement From the American Heart Association. *Circulation.* 121 : 2331-2378.
- Brunekreef, B., Beelen, R., Hoek, G., Schouten, L., Bausch-Goldbohm, S., Fisher, P., *et al.* 2009. Effects of long-term exposure to traffic-related air pollution on respiratory and cardiovascular mortality in the Netherlands: the NLCS-AIR study. *Res Rep Health Eff Inst.* 139: 5-71; discussion 73-79.
- Chen, F., Deng, Z., Deng, Y., Qiao, Z., Lana, L., Meng, Q., *et al.* 2016a. Attributable risk of ambient PM10 on daily mortality and years of life lost in Chengdu, China. *Science of the Total Environment.* xxx:xxx-xxx.
- Chen, L., Shi, M., Gao, S., Li, S., Mao, J., Zhang, H., *et al.* 2016b. Assessment of population exposure to PM2.5 for mortality in China and its public health benefit based on BenMAP. *Environmental Pollution.* xxx:1-7.
- Chu, S.H. and Paisie, J.W. 2006. An evaluation of current PM2.5 conditions in the US. *Atmospheric Environment.* 40: S206-S211.
- Csavina, J., Field, J., Félix, O., Corral-Avitiac, A.Y., Sáeza, A.E., and Betterton, E.A. 2013. Effect of Wind Speed and Relative Humidity on Atmospheric Dust Concentrations in Semi-Arid Climates. *Sci Total Environ.* 15(487): 82-90.
- Du, Y., Xu, X., Chu, M., Guo, Y. and Wang, J. 2016. Air particulate matter and cardiovascular disease: the epidemiological, biomedical and clinical evidence. *J Thorac Dis.* 8(1) : E8-E19.
- Fang, X., Bi, X., Xu, H., Wu, J., Zhang, Y., Feng, Y. 2017. Source apportionment of ambient PM10 and PM2.5 in Haikou, China. Accepted Manuscript. *Atmospheric Research.* S0169-8095(16) : 30293-9.
- Freitas, M.C., Pacheco, A.M.G., Verburg, T.G., Wolterbeek, H.T. 2010. Effect of particulate matter, atmospheric gases, temperature, and humidity on respiratory and circulatory diseases' trends in Lisbon, Portugal. *Environ Monit Assess.* 162 : 113-121.
- Giri, D., Murthy, V.K. and Adhikary, P.R. 2008. The Influence of Meteorological Conditions on PM10 Concentrations in Kathmandu Valley. *Int. J. Environ. Res.* 2(1): 49-60.
- Jallad, F.A., Katheeri, E.A. and Omar, M.A. 2013. Concentrations of particulate matter and their relationships with meteorological variables. *Sustain. Environ. Res.* 23(3): 191-198.
- Katsouyanni, K. 2003. Ambient air pollution and health. *British Medical Bulletin.* 68 : 143-156.
- Kim, E. and Hopke, P.K. 2011. Characterization of fine particle sources in the Great Smoky Mountains area. *Science of the Total Environment.* 368:781-794.
- Li, G., Sun, J., Jayasinghe, R., Pan, X., Zhou, M., Wang, X., Cai, Y., Sadler, R., Shaw, R. 2012. Temperature Modifies the Effects of Particulate Matter on Non-Accidental Mortality: A Comparative Study of Beijing, China and Brisbane, Australia. *Public Health Research.* 2(2) : 21-27.
- Li, H., Guo, B., Han, M., Tian, M. and Zhang, J. 2015. Particulate Matters Pollution Characteristic and the Correlation between PM (PM_{2.5}, PM₁₀) and Meteorological Factors during the Summer in Shijiazhuang. *Journal of Environmental Protection.* 6:457-463.
- Lin, Z.J., Tao, J., Chai, F.H., Fan, S.J., Yue, J.H., Zhu, L.H., *et al.* 2013. Impact of relative humidity and particles number size distribution on aerosol light extinction in the urban area of Guangzhou. *Atmos. Chem. Phys.* 13 : 1115-1128.
- Lin, H., Tao, J., Du, Y., Liu, T., Qian, Z., Tian, L. *et al.* 2016. Particle size and chemical constituents of ambient particulate pollution associated with cardiovascular mortality in Guangzhou, China. *Environmental Pollution.* 208 : 758-766.
- Owoade, O.K., Olise, F.S., Ogundele, L.T., Fawole, O.G. and Olaniyi, H.B. 2012. Correlation Between Particulate Matter Concentrations and Meteorological Parameters at a Site in Ile-Ife, Nigeria. *Ife Journal of Science.* 14(1): 83-93.
- Pant, P., Guttikunda, S.K. and Peltier, R.E. 2016. Exposure to particulate matter in India: A synthesis of findings and future directions. *Environmental Research.* 147:480-496.

- Pope III, C.A. and Dockery, D.W. 2009. Health Effects of Fine Particulate Air Pollution: Lines that Connect. *Journal of the Air & Waste Management Association*. 56(6):709-742.
- Rathla, K.S.G., Sankarappa, T., Ashwajeet, J.S. and Ramanna, R. 2015. Effect of Temperature, Humidity and other Physical Parameters on Air Pollution in and Around Belagavi, Karnataka, India. *Int. Res. J. Environment Sci.*4(7):55-62.
- Stockfelt, L., Andersson, E.M., Molnar, P., Gidhagen, L., Segersson, D., Rosengren, A., et al. 2017. Long-term effects of total and source-specific particulate air pollution on incident cardiovascular disease in Gothenburg, Sweden. *Environmental Research*. 158:61-71.
- Tai, A.P.K., Mickley, L.J. and Jacob, D.J. 2010. Correlations between fine particulate matter (PM_{2.5}) and meteorological variables in the United States: Implications for the sensitivity of PM_{2.5} to climate change. *Atmospheric Environment*. 44: 3976-3984.
- WHO. 2016. *Ambien Air Pollution: a global assessment of exposure and burden of disease*. Geneva: World Health Organization.
- Yao, X., Lau, T.L., Fang, M. and Chan, C.K. 2007. Correlations of Ambient Temperature and Relative Humidity with Submicron Particle Number Concentration Size Distributions in On-Road Vehicle Plumes. *Aerosol Science and Technology*. 41:692-700.
- Zhang, Y., He, M., Wu, S., Zhu, Y., Wang, S., Shima, M., Tamura, K. and Ma, L. 2015. Short-Term Effects of Fine Particulate Matter and Temperature on Lung Function among Healthy College Students in Wuhan, China. *Int. J. Environ. Res. Public Health*.12:7777-7793.
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