CORRELATION_OF_PARTICULATE_MATTER_TO_CORONARY_HEART.pdf

by Totong Kamaluddin3

Submission date: 01-Jul-2021 09:59AM (UTC+0700)
Submission ID: 1614408802
File name: CORRELATION_OF_PARTICULATE_MATTER_TO_CORONARY_HEART.pdf (1.81M)
Word count: 3707
Character count: 20131

AJM BES Vol. 20, No. 2, 2018 (ISSN 0972-3005)

Asian Journal of Microbiology, Biotechnology & Environmental Sciences

MICROBIOLOGY

BIOTECHNOLOGY

ENVIRONMENTAL SCIENCES

Editors
P.K. Wong
R.K. Trivedy
Sadhana Sharma

Global Science Publications, India

ASIAN JOURNAL OF MICROBIOLOGY, BIOTECHNOLOGY AND ENVIRONMENTAL SCIENCES

(VOL. 20 NO. 2, 2018)

CONTENTS

Article-44

Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 20 (2) : 2018 : 296-299
© Global Science Publications
ISSN-0972-3005

CORRELATION OF PARTICULATE MATTER TO CORONARY HEART DISEASE IN PALEMBANG

MARSIDI*[1,2], M.T. KAMALUDDIN[3], FAUZIAH N. KURDI[4] AND NOVRIKASARI[5]

[1]Environmental Science Department, Postgraduate Program,Sriwijaya University, Palembang, Indonesia
[2]Public Health Department, Postgraduate Program, BinaHusada College of Health Sciences, Palembang, Indonesia
[3]Faculty of Medicine, Sriwijaya University, Palembang, Indonesia
[4]Faculty of Education, Sriwijaya University, Palembang Indonesia
[5]Faculty of Public Health, Sriwijaya University, Palembang, Indonesia

(Received 17 February, 2018; accepted 21 March, 2018)

Key words : *$PM_{2.5}$, PM_{10}, Coronary Heart Disease, Palembang*

Abstracts – The short-term particulate exposures stimulate the heart attacks in the risk-population and increase the mortality. The study aims to prove the correlation of particulate exposure to the coronary heart disease in Palembang. The particulate data ($PM_{2.5}$ – PM_{10}) are obtained from the measurements on the parking zone of 39 puskesmas (primary health care) in Palembang in which the data of coronary heart diseases are obtained from the data of new outpatient who visit at the puskesmas reported at health office department of Palembang. The data is formed in the forms of average, standard deviation, minimum and maximum, and analyzed statistically with Spearman correlation method.The results present that there is no correlation between the particulate exposure ($PM_{2.5}$ and PM_{10}) against coronary heart disease in Palembang.

INTRODUCTION

The recent research suggests that the short-term exposure could trigger the heart attacks in the risk-population and increase the mortality (Brook *et al.*, 2010). Chen *et al.* (2016a) conducted a study on the effect of $PM_{2.5}$ exposure on the population causing death in China and found that the reducing of the mean annual concentration of $PM_{2.5}$ by 35 $mg.m^{-3}$ could decrease the annual death rate for cardiovascular, lung cancer, and respiratory diseases of 89.000, 47.000, and 32.000, respectively. Furthermore, Chen *et al.* (2016b) assessed the risk of ambient PM_{10} causing the death and the results showed that PM_{10} effects in the years of life lost in men and parents

The WHO database compiles $PM_{2.5}$ and PM_{10} from the measurements for approximately 3000 cities around the world and estimates only one in ten people breathing with the clean air (WHO, 2016). The particle pollutants could form the small solid or liquid particles in the air (Dockery, 2009; Brook *et al.*, 2010; WHO, 2016). The ambient particulates have a devastating impact on the human health (Katsouyanni, 2003; Pope III and Dockery, 2009; Brook *et al.*, 2010; Du *et al.*, 2016; Chen *et al.*, 2016a; Bourdrel *et al.*, 2017). These small particles pose a health risk because the particles can be 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 fine particles, smaller in diameter than 2.5 microns (about 30 times smaller than the diameter of a human hair) (WHO, 2016). These microscopic particles, known as $PM_{2.5}$ that inhale to the lungs, generate the health problems and in the long-term exposure exacerbate the respiratory problems. The high concentrations of $PM_{2.5}$ initiate the coughing, irritation of the eyes, nose, throat (WHO, 2016), lung irritation, and shortness of breath (Brunekreef *et al.*, 2009), cardiovascular (Freitas *et al.*, 2010; Brook *et al.*, 2010; Du *et al.*, 2016; Stockfelt *et al.*, 2017), atherosclerosis (Brook and Rajagopalan, 2010). Some groups are very sensitive to $PM_{2.5}$ including children, the elderly, and people with existing respiratory problems including asthma and respiratory organ

Corresponding author's email: marsidisaid@gmail.com
[1]Doctoral Student of Environmental Science

problems and liver. The long-term $PM_{2.5}$ exposure is associated with the increase of mortality (Brook *et al.*, 2010; Du *et al.*, 2016), especially in coronary heart disease(Gill *et al.*, 2011; Ye *et al.*, 2016; Pena and Rollins, 2017). The study aims to prove the correlation of particulate exposure to the coronary heart disease in Palembang

MATERIALS AND METHODS

The data of $PM_{2.5}$ and PM_{10} were obtained from the measurements using mini particle counter DT-96 (CEM, Shenzhen-China)at 39 puskesmas (primary health care) in Palembang in the fourth week of January 2018. The data of patients with the coronary heart disease in 2017 was obtained from the reports of outpatient visitation at 39 puskesmas to health service department in Palembang. All the data was processed in the forms of average data, standard deviation, minimum and maximum and analyzed by Spearman method.

RESULTS

Fig, 1 showed the location of puskesmas in Palembang. The data of particulate measurement and data collection of coronary heart disease at 39 puskesmas in Palembang were shown in table 1. Table 1 and Fig. 2 showed that the ambient of $PM_{2.5}$ had an average value of 10.77 $\mu g.m^{-3}$ with a standard deviation of 5.59. The minimum and maximum value of $PM_{2.5}$ were 4 $\mu g.m^{-3}$and 33 $\mu g.m^{-3}$ located in the puskesmas of Multi Wahanaand Plaju. For the ambient of PM_{10}, the average value was measured as 19.46 $\mu g.m^{-3}$ with a standard deviation of 9.37 the obtained minimum and maximum value of PM_{10} were 9 $\mu g.m^{-3}$ and 44 $\mu g.m^{-3}$, respectively which located in the puskesmas of Multi Wahana and Boom Baru.

Table 1. Data of PM Ambient and CHD of Puskesmas in Palembang.

Variables	Mean	SD	Min	Max
$PM_{2.5}$ ($\mu g.m^{-3}$)	10.8	5.59	4	33
PM_{10} ($\mu g.m^{-3}$)	19.5	9.37	9	44
CHD (n)	24.5	51.09	0	218

According to the threshold limit value (TLV) byWHO in which the TLV for $PM_{2.5}$was 25 $\mu g.m^{-3}$and $PM_{10}$was 50 $\mu g.m^{-3}$, there was only one puskesmas that exceeded the TLV of $PM_{2.5}$ where is the puskesmas of Plaju with the level of concentration equal to 33 $ug.m^{-3}$. For PM_{10}, there no

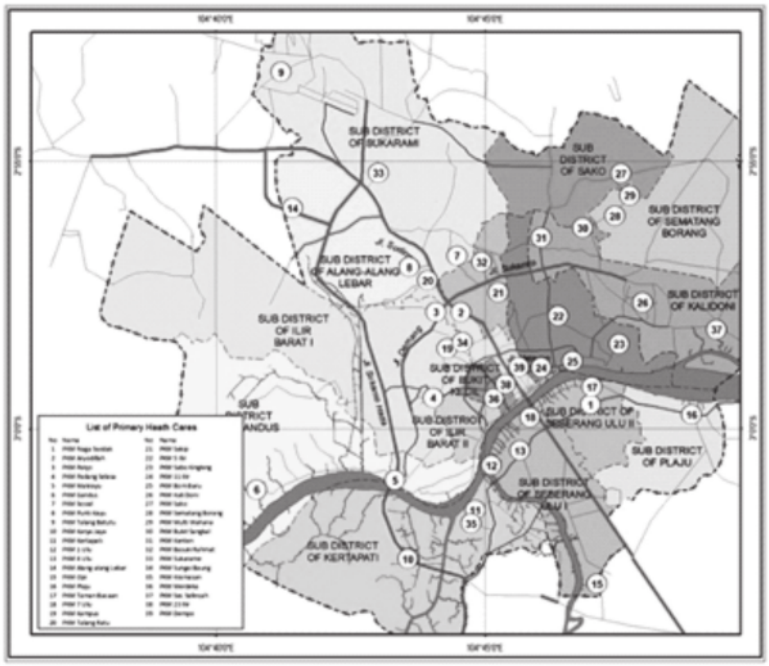

Fig. 1. Map location of Puskesmas in Palembang

puskesmas exceed the TLV.

Table 1 and Fig. 2 represented that the patient of coronary heart disease had an average value of 24.5 patientswith a standard deviation of 51.09. The minimum and maximum value of the patient of coronary heart disease were 0 patient (in the puskesmas of Makrayu, Gandus, 1 Ulu, 4 Ulu, Kertapati, Nagaswidak, Taman Bacaan, Kampus, 11 Ilir, 23 Ilir, Talang Ratu, Sekip, Sabokingking, Sei Selincah, Multi Wahana, Talang Betutu and Karya Jaya) and 218 patients (Sukarami).

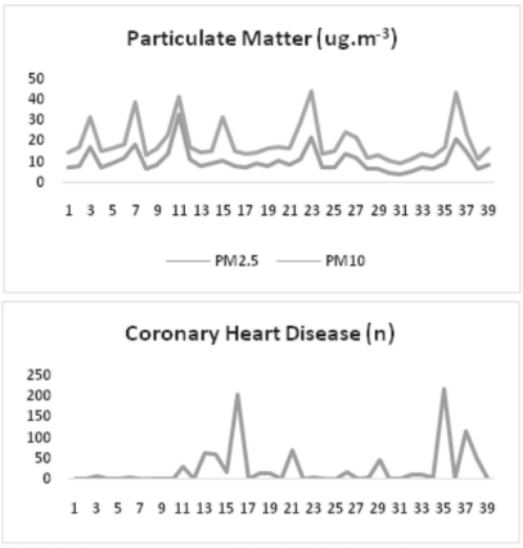

Fig. 2. The results of PM Measurements and CHD outpatients of 39 Puskesmas in Palembang.

Table 2 provided the data of correlation test results between the particulate matters ($PM_{2.5}$ and PM_{10}) and coronary heart disease in Palembang. There was a significantly correlation between $PM_{2.5}$ and PM_{10} ($r = 0.952$; $p = 0.001$). In the other hand, there was an in significantly correlation between $PM_{2.5}$ with coronary heart disease ($r=0.010$; $p=0.954$), and PM_{10} with coronary heart disease ($r = -0.065$; $p = 0.693$).

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

Variables		PM_{10}	CHD
$PM_{2.5}$	Cor. Coefficient	0.952	0.010
	Sig. (2 tailed)	0.001	0.954
PM_{10}	Cor. Coefficient		-0.065
	Sig. (2 tailed)		0.693

From the annual report of patients visiting at puskesmas in Palembang, in 2017, the highest patient visiting occurred at the puskesmas of Sukarame (218 patients) but had the low particulate exposure ($PM_{2.5}$ and PM_{10}) level (10 $ug.m^{-3}$; 17 $ug.m^{-3}$) whereas in some puskesmas such as Talang Betutu and Boom Baru, no coronary heart disease patients visit even showing the high level of particulate exposure (22 $ug.m^{-3}$; 44 $ug.m^{-3}$). This showed that the occurrences of coronary heart disease in Palembang was not caused by the particulate exposure but caused by the other factor.

DISCUSSION

The results found that there was no correlation between the particulate exposure with the coronary heart disease because the level of particulate exposure was below the permitted TLV. The most possibilities reason was that the measurement was conducted in the rainy season (wet season) caused the particulate fall faster to the ground. The result was supported by Owoade *et al.* (2012) and Jallad *et al.* (2013) mentioned that the level of particulates varied based on the season in which the dry season had the high concentration and the wet season had a low concentration.

Some factors generating the coronary heart disease could be initiated by several things such as hypertension, dietary patterns, exercise, and emotional stress (Institute of Medicine. 2010; Brook *et al.*, 2010; Gill *et al.*, 2011; Cosselman *et al.*, 2015; WHO, 2016; Stockfelt *et al.* 2017). The coronary heart disease became the center of the world attention because of the number of the patient continuously growing up in some developing country (Gresh *et al.*, 2010; Institute of Medicine, 2010), especially in Indonesia (WHO, 2011).

Cassee *et al.* (2013) obtained the results that most evidence of carbon accumulation generated by the traffic has the bad effect on the human health. Traffic that produced dust coming from roads, brakes, and tires, contributed to adverse the health effects.The duration of particulate exposure had been associated with adverse effects of exposure to the coronary heart disease. The results was supported by Pope III and Dockery (2009); Brook *et al.* (2010), Cosselman *et al.* (2015), and Du *et al.* (2016) that found that the particulate effects related to cardiovascular health and increased the knowledge of the common pathophysiology pathway that connected the particulate exposure

with the cardiopulmonary resulting in the morbidity and mortality.

CONCLUSION

The exposures of $PM_{2.5}$ and PM_{10}in Palembang was below the threshold limit value arranged by WHO. The results obtained that there was no correlation between the particulate ($PM_{2.5}$ and PM_{10}) against the coronary heart disease in Palembang.

ACKNOWLEDGEMENT

The authors are very thankful to the Directorate General of Higher Education of the Ministry of Research and Technology and Higher Education for this fund research help through the doctoral research grants.

REFERENCES

Bourdrel, T., Bind, M.A., Béjotc, Y., Moreld, O., Argacha, J.F. 2017. Cardiovascular effects of air pollution. *Archives of Cardiovascular Disease*. xxx: xxx—xxx .

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.

Cassee, F.R., Heroux, M.E., Gerlofs-Nijland, M.E. and Kelly, F.J. 2013. Particulate matter beyond mass: recent health evidence on the role of fractions, chemical constituents and sources of emission. *Inhalation Toxicology*. 25 (14) : 802-812.

Cosselman, K.E., Navas-Acien, A. and Kaufman, J.D. 2015. Environmental factors in cardiovascular disease. *Nat. Rev. Cardiol*. 152 : 16 pp.

Chen, F., Deng, Z., Deng, Y., Qiao, Z., Lana, L., Meng, Q., *et al.* 2016a. Attributable risk of ambient PM_{10} on daily mortality and years of life lostin 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 $PM_{2.5}$ for mortality in China andits public health benefit based on BenMAP. *Environmental Pollution*.xxx:1-7.

Dockery, D.W. 2009. Health Effects of Particulate Air Pollution. *Ann Epidemiol*. 19 : 257–263.

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.

Gill, E.A., Curl, C.L., Adar, S.D., Allen, R.W.,Auchincloss, A.H., O'Neill, M.S., *et al.* 2011. Air Pollution and Cardiovascular Disease in the Multi-Ethnic Study of Atherosclerosis (MESA). *Prog Cardiovasc Dis*. 53(5) : 353–360.

Gersh, B.J., Sliwa, K., Mayosi, B.M., and Yusuf, S. 2010. The epidemic of cardiovascular disease in the developing world: global implications. *European Heart Journal*. 31 : 642–648.

Institute of Medicine. 2010. *Promoting CardiovascularHealth in the Developing World: A Critical Challenge to Achieve Global Health*. Washington, DC: The National Academies Press.

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.

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: Asynthesisof findings and future directions. *Environmental Research*. 147: 480–496.

Pena, M.S.B. and Rollins, A. 2107. Environmental Exposures and Cardiovascular Disease: A Challenge for Health and Development in Low-and Middle Income Countries. *Cardiol Clin*. 35(1) : 71–86

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.

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 onincident cardiovascular disease in Gothenburg, Sweden. *Environmental Research*. 158:61–71.

WHO. 2016. *Ambien Air Pollution: a global assessment of exposure qnd burden of disease*. Geneva: World Health Organization.

WHO. 2011. Global Atlason cardiovascular disease prevention and control. Geneva: World Health Organization.

Ye, X., Peng, L., Kan, H., Wang, W.,4, Geng, F., Mu, Z. *et al*. 2016. Acute Effects of Particulate Air Pollution on the Incidence of Coronary Heart Disease in Shanghai, China. *PLoS ONE*. 11(3):e0151119. 11 pp.

CORRELATION_OF_PARTICULATE_MATTER_TO_CORONARY_H...

ORIGINALITY REPORT

20%	14%	9%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

1%

★ staff.sci.ubu.ac.th

Internet Source

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		