



PROCEEDING

conference and exhibition

Addressing Tobacco Problems in Developing Countries

Economic Impact of Tobacco Use
Social Determinants of Tobacco Use and Demand Reduction Interventions
Culture, Employment and Agriculture: Between Tobacco Myth and Reality
Tobacco Use and Health
Youth, Cigarettes, and Drugs



Wednesday - Thursday, December 5-6, 2012

University of Muhammadiyah Yogyakarta

conference and exhibition

Addressing Tobacco Problems In Developing Countries

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**SEED RESEARCH
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Abstract

THE EFFECT OF SECOND HAND SMOKE EXPOSURE ON LUNG FUNCTION AND URINE COTININE OF CAFÉ AND RESTAURANT EMPLOYEE IN SEMARANG CITY

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ABSTRACT

BACKGROUND: Second Hand Smoke (SHS) has been widely demonstrated as a risk factor for many health problems. Air Quality Monitoring Survey in 2011 at 78 public places in the city of Semarang with Side pack Aerosol tool obtained the data that the average of PM2.5 in places where smoking allowed was 94.76mg/m³ and in the place where smoking was not allowed smoking was 34.60mg/m³. Café and restaurant was the public places with the highest PM2.5 levels. The average of PM2.5 in restaurant was 72.60mg/m³, while in the café was 164.84

OBJECTIVE: This research aims to determine how the effects of secondhand smoke exposure on lung function and urine cotinine levels of café and restaurant employee in the Semarang city. **METHODS:** Data is collected from 13 cafes and restaurants and the respondents are 70 non-smokers employees. The instruments used are spirometry to determine lung function, enzymelinked immunosorbent assay (Elisa) to measure urine cotinine, side pack aerosols to measure PM2.5, and questionnaire to identify the characteristics and SHS exposure.

RESULTS: Most of the employees, 52 people (74.3%) have normal pulmonary function. However, there are 14 people (20%) have mild restriction, 2 people (2.9%) have mild obstruction and 2 people (2.9%) have moderate obstruction. Moderate obstructive lung function problems 100% occurred in cafe employee. The average level of urine cotinine of cafe employee is 42.902ng/ml, while a restaurant employee is 33.609 ng/ml. The average of PM2.5 levels in the Cafe was 121.65 µg/ m³, twice as much compared to the average of PM2.5 levels in Restaurant (68.27 µg/m³). There is a positive correlation between time of SHS exposure per day and urine cotinine levels ($\rho = 0.364$, $p\text{-value} = 0.002$) and there is a relationship between colleague behavior and urine cotinine levels ($p\text{-value} = 0.006$). The age is correlated with lung function ($\rho = -0.272$, $p\text{-value} = 0.023$) and there was inversely correlation between urine cotinine and lung function ($\rho = -0.266$, $p\text{-value} = 0.026$).

RECOMENDATION: Semarang City Legislative should establish The Smoking Free Area Law immediately and followed by firm law enforcement for the protection of the people from secondhand smoke exposure and prevent them from many further health issues.

Full Paper

THE EFFECT OF SECOND HAND SMOKE EXPOSURE ON LUNG FUNCTION AND URINE COTININE OF CAFÉ AND RESTAURANT EMPLOYEE IN SEMARANG CITY

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I. INTRODUCTION

Second Hand Smoke (SHS) has been widely demonstrated as a risk factor for many health problems. According to the CDC, nearly 50,000 Americans die each year from lung cancer and heart disease caused by exposure of second hand smoke.¹

SHS exposure causes heart disease and increases the risk of dying from the disease by about 30%. While the impact on pregnancy can cause low birth weight (LBW) and premature birth, Sudden Infant Death Syndrome (SIDS), and stunted fetal growth and spontaneous abortion.^{2,3} Cigarette smoke contains 4000 toxic chemicals and no less than 69 are carcinogenic.⁴

SHS is also a serious problem in the workplace. According to estimates of the International Labor Organization (ILO) in 2005 no less than 200,000 workers die each year because of secondhand smoke exposure to in the workplace. Death due to secondhand smoke exposure is one of the seven causes of work-related deaths.⁵

The prevalence of male smokers in Indonesia 63.1%, while 4.5% of women.⁶ WHO Report from the Global Tobacco Epidemic, 2008 report that Indonesia was the third largest consumer of cigarettes in the world.⁷ This condition causes 97 million of Indonesia non-smokers people exposed regularly to secondhand smoke.⁸ Secondhand smoke is dangerous indoor air pollutant because more than 90% of people spend their time indoors.⁹ Researchers have conducted a survey on employees timber industry in Jepara district in 2010 and get the data that 86.5% of smokers smoke in the workplace, even in between working time.

Air Quality Monitoring Survey conducted in 2011 at 78 public places in the city of Semarang with Aerosol Side pack tool found that the average of PM_{2.5} levels in places where smoking was allowed was 94.76 µg/m³ while at a place that smoking was not allowed is 34.60 µg/m³. The average of PM_{2.5} in places that smoking was allowed was 3 times higher than places that smoking was not allowed. This value is higher than the WHO threshold limit value target (25 µg/m³).

Lungs are the vital respiratory organs of human that affected directly when the person was exposed to secondhand smoke exposure. Therefore the effects of secondhand smoke exposure can be verified by measuring a person's lung function.^{10,11} The passive smoker will inhale nicotine and other toxic substances in cigarette smoke (secondhand smoke).¹² Cotinine is the major metabolism of nicotine, which has been widely used as a biomarker of secondhand smoke exposure.¹³ Cotinine concentration in plasma, urine, and saliva from non smokers have been used to assess secondhand smoke exposure in environment with the purpose of developing lung cancer risk estimates associated with exposure to secondhand smoke.¹⁴

The purpose of this research was to know the effect of Second Hand Smoke Exposure on Lung Function and Urine Cotinine of Café and Restaurant Employee of Semarang City

II. METHODS

Data was collected from 13 cafes and restaurants. The respondents are 70 non-smokers employees. The instruments were spirometry to determine lung function, enzyme-linked immunosorbent assay (Elisa) to measure urine cotinine, side pack aerosols to measure PM2.5, and questionnaire to identify the characteristics and secondhand smoke exposure time.

SPSS program was used for data analyzing. The correlation between independent and dependent variable was analyzed by Range Spearman. Independent variables with nominal scale (gender and peers smoking behavior) were analyzed by Chi Square.

III. RESULTS AND DISCUSSION

Passive smokers are the most miserable, because they have to accept the impact of secondhand smoke exposure. The prevalence of Indonesia people who are exposed to secondhand smoke is very high because the prevalence of smoker is very high (males 65.6% and females 5.2%), as well as there is no enforcement of the smoke free are rules.

Cafe and Restaurant is a potential public places that the secondhand smoke exposure was happened. The sources of secondhand smoke exposure in the cafes and restaurants are visitors and employee of the cafe or restaurant itself. The research location is 6 cafe and 7 restaurants in Semarang. Researchers get many difficulties to get the permission from the owner of the cafe and restaurant because most of them afraid, it would result in adverse impact for their business continuity and many cafes and restaurants have been got the sponsorship from tobacco industry.

The Respondents in the cafe was less than restaurant, which are 28 people (40%) in the cafe and 42 people (60%) in the restaurant.

The male and female employee were the same proportion (50%), the majority of them (81.4%) have high school education. The average age of employee was 26 years (CI: 24.5-28.4), and the average of work time period was 3.6 years (CI: 2.2-4.9). The schedule of work time in the cafes and restaurants were divided into 2 shifts. Employee work more than 8 hours per day were 28 people (40%), the average of working hours was 8.8 hours per day (CI: 8.3 to 9.3).

Table 1. Respondents Characterictics

Characteristics	Cafe (n=28)		Restoran (n=42)	
	f	%	f	%
Sex				
Male	16	45.7	19	54.3
Female	12	34.3	23	65.7

Characteristics	Cafe (n=28)		Restoran (n=42)	
	f	%	f	%
Education				
High School	20	35.1	37	64.9
Academy	3	42.9	4	57.1
Undergraduate	5	83.3	1	16.7
Age (years) (Mean: 26.4; CI: 24.5-28.4)				
≤ 21	8	38.1	13	61.9
22 - 24	8	50.0	8	50.0
25 - 28	9	50.0	9	50.0
≥ 29	3	20.0	12	80.0
Working time period (years) (Mean: 3.6; CI: 2.2-4.9)				
< 0.6	7	36.8	12	63.2
0.6 - 1.6	8	53.3	7	46.7
1.7 - 3.6	3	21.4	11	78.6
> 3.6	7	41.2	10	58.8
Working time per day (hours) n=70 (Mean: 8,8; CI: 8,3-9,3)				
≤ 8 hours	21	50.0	21	50.0
> 8 hours	7	25.0	21	75.0

All employees were exposed to secondhand smoke in the workplace. There were two cafes and two restaurants that have smoking sections and non-smoking section. Smoking section located outside the room and directly connected to the outside air, however, cafe and restaurant employees still exposed to smoke from the visitors, especially when they serve the visitor or clear the table. Besides visitors, co workers were also a source of exposure to secondhand smoke, visible from 57 employees (81.4%) had co workers who smoke in the workplace. Usually co-workers smoked at the rest time or in the working time in the bathroom or in the back of the work site. The employee also exposed secondhand smoke at home; they were 47 people (67.1%). They live with their fathers or husbands smokers, or live in a boarding house with a smoker friend. It was difficult to avoid, such as the results of a 2007 Riskesdas get the data that 40.5% of the population in Indonesia exposed to smoke at home.¹⁵

Table 2. The exposure of secondhand smoke

The exposure of secondhand smoke	Cafe (n=28)		Restoran (n=42)	
	f	%	f	%
Living in the same home with smoker (n=70)				
Yes	17	36.2	30	63.8
No	11	47.8	12	52.2

The exposure of secondhand smoke	Cafe (n=28)		Restoran (n=42)	
	f	%	f	%
Colleques smoking at the work place (n=70)				
Yes	26	45.6	31	54.4
No	2	15.4	11	84.6
PM_{2.5} Level in the working place* (n=13)				
Mean = 92.903 (CI: 51.967-133.839)	121.65 µg/m ³		68.27 µg/m ³	
Moderate (16-40 µg/m ³)	1	25	3	75
Unhealthy for sensitive (41-65µg/m ³)	0	0	1	100
Unhealthy (66-150 µg/m ³)	2	50	2	50
Very unhealthy (151-250 µg/m ³)	3	75	1	25
PM_{2.5} Level accepted by employee * (n=70)				
Moderate (16-40 µg/m ³)	6	21.4	22	78.6
Unhealthy for sensitive (41-65µg/m ³)	0	0.0	7	100.0
Unhealthy (66-150 µg/m ³)	9	45.0	11	55.0
Very unhealthy (151-250 µg/m ³)	13	86.7	2	13.3
The average of exposure time of secondhand smoke in the workplace	4.4 jam/hari		5.1 jam/hari	

* EPA classification

PM_{2.5} level in cafes and restaurants showed an alarming condition, 4 sites (30.8%) were unhealthy level and 4 sites (30.8%) were very unhealthy, so that, 50% of employees exposed to unhealthy and very unhealthy air. It should be a serious concern considering the average of employee working time was 8.8 hours a day. The average of PM_{2.5} levels in the Cafe was 121.65 µg/m³, twice as much in Restaurant (68.27 µg/m³).

Table 3. Lung Function of the employee

Lung Function (n=70)	Cafe		Restoran	
	f	%	f	%
moderate obstructive	2	100,0	0	0,0
mild obstructive	1	50,0	1	50,0
mild restictive	6	42,9	8	57,1
Normal	19	36,5	33	63,5

Based on the results of lung function with spirometry measurements were compared with the predictions of the Pneumobile ® Project Indonesia standard, most of the employee, 52 people (74.3%) was normal lung function. However, there were 14 people (20%) had mild restrictive lung function, 2 people (2.9%) had mild obstructive lung function, and 2 people (2.9%) had moderate obstructive lung function . Most of employee are young, 26.4 years old (CI: 24.5 to 28.4) allows lung problems have not Occurred, however, with age the likelihood of lung function abnormalities will be greater. Obstructive lung problems occurred in 100% employee cafe, while normal lung function was happened in the restaurant employees (63.5%) more than the cafe employees (35.5%). This was because of the

secondhand smoke exposure in the cafe is much higher than the restaurant (average PM2.5 levels in the Cafe was 121.65 $\mu\text{g}/\text{m}^3$, in the restaurant (68.27 $\mu\text{g}/\text{m}^3$). Results Kauffmann, 1989 , showed a positive relationship between passive smoking with respiratory symptoms and lung function.¹⁶

Table 4. Urine Cotinine of Employee

Cotinine (ng/ml) n=70	Cafe	Restoran
	Min	1,649
Maks	>315*	>315*
Mean	42,902	33,609

*Maximum value, read by ELISA

The impact of secondhand smoke exposure is also found in urine cotinine levels of employee. The average urine cotinine of cafe employee was 9ng/ml higher than restaurant employee. The average levels of urine cotinine of cafe employees was 42.902 ng / ml, while restaurant employees 33.609 ng/ ml.

Cotinine is a metabolite of nicotine in the urine, that is recommended as a quantitative measure of nicotine intake and thus as a biomarker for second hand smoke exposure.¹⁷ Health risks faced by employees is very large. Inhaling secondhand smoke has harmful effects on the cardiovascular system that can increase the risk of heart attack, especially those who already have heart disease affects the risk. Nonsmokers exposed to secondhand smoke at home or at work increase the risk of heart disease by 25-30% and / or lung cancer by 20-30%.¹⁸

Table 5. Correlation between variables and Employee Urine Cotinine

Variables	Rho	p-value
Age	-0.068	0.575 ¹⁾
Sex		0.881 ²⁾
Worktime period (years)	-0.062	0.613 ¹⁾
Exposure time/day	0.364	0.002* ¹⁾
Secondhand smoke exposure by colleagues		0.006* ²⁾
PM _{2.5}	0.095	0.435 ¹⁾

¹⁾ Spearman Range test

²⁾ Chi Square test

* Correlation is significant

Spearman Range test results a positive correlation between exposure time/day and urine cotinine levels of employees (rho = 0.364, p-value = 0.002). The longer employee was exposed to secondhand smoke in the workplace each day will increase the levels of employee urine cotinine. In addition, the chi square test of secondhand smoke exposure by colleagues

was correlated with urine cotinine levels (p-value=0.006). To control this problem, it should be implemented the smoke free area regulation in the workplace. Restaurant and cafe should provide a smoking area that is separated of the room or building, so the secondhand smoke would not expose other non- smoker employees. The Law. Number 36 of 2009 on health chapter 115, declare that smoke free area are: healthcare facilities; educational places; playground; worship; public transport, workplaces, and public places and other define places.¹⁹ Cafe and Restaurant included in the two criteria, namely workplaces and public places so that should be a smoke free area.

Table 6. Correlation between variables and Employee Lung Function

Variables	Rho	p-value
Age	-0.272	0.023* ¹⁾
Sex		0.550 ²⁾
Worktime period (years)	-0.176	0.144 ¹⁾
Exposure time/day	-0.147	0.226 ¹⁾
Secondhand smoke exposure by colleagues		0.160 ²⁾
PM _{2.5}	-0.176	0.145 ¹⁾
Cotinine Urine	-0.266	0.026* ¹⁾

¹⁾ Spearman Range test

²⁾ Chi Square test

* Correlation is significant

There was correlation between age and lung function (rho = -0.272, p-value = 0.023). Although age is the correction factor in the pulmonary function test by spirometry device, but this variable was negatively correlation to lung function. This makes sense because with age the lungs of an employee will receive exposure to pollutants, including secondhand smoke.

Urine cotinine was correlated with lung function (rho = -0.266, p-value 0.026). The higher levels of cotinine in the urine of employees will decrease lung function. Cotinine was a biomarker for secondhand smoke exposure.¹⁷ This was consistent with HK Lai research that lung function is negatively related to exposure to second hand smoke in the workplace.²⁰

IV. CONCLUSIONS AND RECOMENDATIONS

The conclusions of this research are: most of the employees, 52 people (74.3%) had normal pulmonary function. However, there are 14 people (20%) had mild restriction, 2 people (2.9%) mild obstruction and 2 people (2.9%) moderate obstruction. Moderate obstructive lung function problems 100% occurred in cafe employees. The average level of urine cotinine of cafe employees was 42.902ng/ml, while a restaurant employee was 33.609 ng/ml. The average of PM_{2.5} levels in the Cafe was 121.65 µg/m³, twice as much compared to the average of PM_{2.5} levels in Restaurant (68.27 µg/m³).

There was a positive correlation between time of secondhand smoke exposure per day and urine cotinine levels (rho = 0.364, p-value = 0.002) and there was a relationship between colleagues behavior and urine cotinine levels (p-value = 0.006). The age was correlated with

lung function ($\rho = -0.272$, $p\text{-value} = 0.023$) and there was inversely correlation between urine cotinine and lung function ($\rho = -0.266$, $p\text{-value} = 0.026$).

Semarang City Legislative should establish Smoke Free Area Law immediately and followed by law enforcement for the protection of the people from secondhand smoke exposure and prevent them from many health problems, such as cardiovascular disease and cancer.

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